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FOOD MANUFACTURE

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FOOD MANUFACTURE

Vol. XII, No. 6 June, 1937

Food and War

THIS MAY be one of our pet themes, but we do feel justified in claiming some priority in having drawn attention to what has for a long time appeared to us to be an urgent necessity—the storage of food against the eventuality of war. As we pointed out two months ago, we have made a contribution to the problem which we believe to be of considerable value. Now, more than twelve months after we began to draw attention to the subject, it is receiving more serious public attention, and has even become a cause for a *Daily Mail* campaign. We are not, of course, going to quarrel with the *Daily Mail* for taking up the cudgels in such a worthy cause, but we hope it will not be made a cause for scaring the public. To say, for example, that the stock of wheat in this country is only sufficient for seventeen days is just grossly inaccurate, and such statements will, in our opinion, nullify any good effect of publicity. Government authorities will simply ignore it, and even the man in the street will not believe the incredible.

If what the *Daily Mail* has to say induces people to take time by the forelock and increase the stocks of imperishable foods in their own larders they will have achieved something we suggested some time ago. If also they succeed in accelerating Government action, which is most imperative, they will have done even more good.

Effective Storage

Whilst we realise that the problem of storage is receiving expert examination on behalf of the Government, and we know that the appropriate articles in FOOD MANUFACTURE have been carefully considered, we are this month making a further contribution to the study of the problem by publishing a special article dealing with the storage of various types of foodstuffs other than cereals (see page 183). Obviously any scheme of storage must take into consideration the optimum conditions for each food product and the maximum length of time for which it can be stored in order to arrive at the storage capacity required to provide a reserve to last a given length of time. But apart from preparing for an emergency, manufacturers will find much valuable data concerning the preservation of foods in prime condition for use in the products they are preparing every day.

Is Pasteurisation Harmful?

The House of Lords, early in May, gave consideration to the report of the Advisory Committee on Nutrition to the Ministry of Health. While much of a very sound and sensible nature emerged from some of the speeches there were also some rather astonishing utterances. The Bishop of Norwich turned his attention to the milk problem and said that one is apt to confuse the nutritive value of milk with the other side of the milk question. He felt that the restrictions now put on the quality of milk were not so necessary as medical men made out, and as a result dairy farmers were striving to reach a standard that, after all, the medical men might one day pronounce to be unnecessary. It is incongruous to hear a pillar of the Church inveighing against the struggle for perfection. The Bishop could not persuade himself that our system of bottling and so on was really satisfactory in delivering milk to the child. All we can say is that it is better than the old way of distributing it in open churns and ladling it out into jugs exposed to the atmosphere. The question of pasteurisation is very confused, some evidence is contradictory and most of the published statements lack conviction. Results obtained at the Shinfield Research Institute indicate that the changes caused by pasteurisation are not serious. It does not affect the nutritional availability of the calcium and the phosphorous or the biological value and true digestibility of the nitrogen. Neither vitamin A nor carotin is damaged; there is a slight loss of vitamins B and C, but these could be made up elsewhere. On balance the evidence appears to

show that milk suffers no serious damage by pasteurisation compared with the risks of drinking it raw.

Examination of Imports

We have recently come across some interesting instances of mistakes by various customs authorities, showing how difficult it is to check the composition of imported products. In the latest case which has come before us, a preparation has been imported into this country for some years with a declaration that it contained no less than five constituents of the United States Pharmacopœia and one from the Mexican Pharmacopœia. In reality none of the preparations is in any pharmacopœia and the product is one which it would be so difficult to examine that it would be practically impossible to state what it did contain. In another instance an importer was prevented from sending into the country tinned fish because he announced on his label that they were preserved with benzoic acid. When we investigated his complaint that other packers of the particular article also used benzoic acid, we found that he was correct, but they did not shout about it. When a certain country issued a list of permitted dyestuffs a British firm of manufacturers found it impossible to obtain the desired tint with the permitted dyestuffs, because they invariably bleached at the temperature of boiling. A prohibited dye was therefore added as well as the permitted one and only the latter was declared. Owing to the difficulty of checking up, the sweets were admitted into the country to which they were sent without hesitation. In another instance the goods of a firm have been stopped in another country because it appears to be impossible to persuade the Customs Authorities of that country that in this particular instance the firm is making a true declaration, and that in reality it is the tests of their chemists which are at fault. The situation is difficult, but it shows that British manufacturers should watch imported products to see that they do comply with the standards of the British law if they are to safeguard their own interests, and it also shows that they may have to form some definite organisation to watch over their interests, when they wish to export to any particular country.

Food at the Paris Exhibition

The layout of the Food Pavilion at the 1937 Exhibition is now decided. This pavilion will be one of the most important in the show, especially when one remembers that 17 per cent. of the population is interested in the food industries. The organisation of the pavilion has been in the hands of Monsieur Rene Cotillion, who is also responsible for the layout of the stands. Visitors will find, on entering the pavilion, a display of all the foodstuffs they consume in the ordinary course of their lives. There will be further displays where visitors may see exactly how various cooked foods are prepared. Most of these demonstrations will be carried out on miniature plants. There will also be stands where almost every kind of foodstuff can be sampled. Orders will be taken at the exhibition, and the industry hopes to be able to gauge, from these orders, which foods are the most popular. The great culinary reputation of France, however, is not to be dwarfed by the side of the food industries. A special gastronomic section, under Dr. André Robine, will show visitors to Paris that France is still a leader in the great art of eating. A "Gastronomic Week" is being organised, and during that week 45 *cordons bleus*, throughout France, will introduce new dishes to amateurs. Both the "Art and Technique" of food will be very much to the fore during the Exhibition.

Colouring Cheese Crusts

Writing in a recent issue of the *Annales des Falsifications et des Fraudes*, J. Pien points out that practically the only effective colouring matter for crusts of cheese of the Dutch type allowed by regulations at present in force in France is alkanet; and he urges that permission should be granted for the use of Sudan IV for the purpose, as being in every way more suitable. In particular, Sudan IV, unlike alkanet, is not affected in colour by the development of alkalinity. The colour is permitted for use in other countries, and is quite safe as demonstrated by experiments on rats. We suggest, however, that tolerance of a particular substance by the rat is not proof that it can be equally well tolerated by human beings. The fat-soluble coal-tar dyes have, in general, a rather bad reputation. In particular, Sudan IV is also known as Biebrich Scarlet R. or Scarlet Red, under which names it is used medicinally in ointments to promote the growth of epithelium in the treatment of wounds, burns, and ulcers. It is emphatically, therefore, not physiologically inactive; and we very much doubt the wisdom of using it as a food colour. Although this might prove irksome to food manufacturers, we are tempted to think that it might benefit the health of the nation if more stringent regulations were in force in this country regarding

the use of coal-tar colours in foodstuffs, similar to those applying in France and many other countries. Sudan IV, we may add, for the benefit of interested readers, is, chemically speaking, *ortho*-toluene-azo-*ortho*-toluene-azo-*beta*-naphthol, and is No. 258 in the *Colour Index*.

Derivatives of p-Hydroxybenzoic Acid in Foods

The esters of para-hydroxybenzoic acid, more especially the methyl and propyl esters, have won great favour as preservatives for use in certain cosmetics and pharmaceutical preparations for external application. In some countries the use of the acid and its esters, either alone or in combination, is permitted for purposes of food preservation. This is not the case in Great Britain, where the preservative regulations prohibit their use for the latter purpose. Imported canned goods, therefore, have frequently to be examined for these preservatives, whose detection and estimation are not particularly easy. F. W. Edwards, F.I.C., H. R. Nanji, Ph.D., D.I.C., F.I.C., and M. K. Hassan, M.Sc., read an important paper dealing with this problem at a recent meeting of the Society of Public Analysts, which has since appeared in the Society's journal. It is easy to detect the presence of an aromatic acid containing an hydroxyl group attached to the benzene nucleus by means of Millon's reagent. The problem is to distinguish between *para*-hydroxybenzoic acid and salicylic acid. Confirmatory tests for salicylic acid and for *para*-hydroxybenzoic acid are described by the authors, the most characteristic being the crystalline precipitate given by copper. The authors have also worked out a colorimetric method, based on the use of Millon's reagent, for determining approximately the proportion of *para*-hydroxybenzoic acid present.

The Bacon Situation

There appears to be a growing apprehension in the bacon industry about the future. The Government do not appear to be in any hurry to do anything to ease the deadlock which has arisen and which, if not grappled with before long will cripple the industry for years to come. The Food Council gave some sound advice in its Annual Report for 1936. "We consider that the present situation emphasises the need for control by a more independent body (*i.e.*, the Bacon Development Board) who can ensure that the contract prices for bacon pigs are as high as the curing industry can afford, and that such prices offer to producers in general a stronger inducement than do open market dealings. Though it is only fair to allow a reasonable time for the reorganisation of the industry and its marketing schemes, such reorganisation would seem, from the above provisions, to be of considerable urgency if the import restrictions are to continue." It is high time the Government stepped in and took control of what the industry itself has failed to do. Some weeks ago in the House of Lords the Earl of Radnor asked the Government's intentions regarding the bacon pig industry. He said that either the scheme must be revived and revised or the organised marketing of bacon pigs would disappear. He suggested the amalgamation of all the bacon factories into one utility corporation. He was informed that his proposals would receive close attention and that is about as far as it has gone. Meanwhile Denmark is smiling.

The Livestock Bill

This Bill is probably one of the most difficult that has had to be framed for the assistance of British agriculture. Doubtless after careful consideration the Ministry of Agriculture has decided that in this case the best method of rendering assistance is by subsidy, and has not relied on a tariff to provide the whole of the relief given to livestock breeders. Nobody seems to be very enthusiastic about it. Even supporters of the Government from agricultural constituencies have been ruthless in their criticism of its inadequacies. On the other hand the Opposition, while deploring the fact that it does not go far enough, are afraid to jeopardise the help it does provide for stock-breeders—little though that may be. We suppose the farmers will assume that they will get some permanent assistance and that the subsidy will go on for ever. At any rate we hope the Bill will give some encouragement and help to a harassed industry. The distributors do not seem at all pleased with the clauses in the Bill dealing with centralised abattoirs. The Minister closed his speech as follows: "Criticism from the distributors' side of the industry had been met and misapprehensions and misunderstandings had been removed." This statement has been severely criticised by leading distributors who maintain that large abattoirs possessing a monopoly over a considerable area will have the effect of lessening the difference in price of English beef in relation to the best imported chilled beef. The Bill has passed its third reading by a substantial majority but, in the words of the B.B.C., the debate continues.

Foot and Mouth Disease

The Foot and Mouth Disease Committee of the Ministry of Agriculture have recently published a further progress report. The Committee was appointed some thirteen years ago and this is the fifth report. It covers five years ended in September, 1935. Unfortunately the labours of the distinguished group of medical and veterinary experts do not appear to have resulted in the discovery of a procedure that can safely replace the existing system of slaughter. The report says that even if an effective method of immunising cattle against the disease were found it would not necessarily result in the existing policy of slaughter being replaced by vaccination, for under the conditions prevailing in this country it seems likely that a slaughter policy may always be necessary to keep such an infectious disease in check.

In spite of this rather disappointing conclusion some very interesting discoveries have been made. It has been discovered that the hedgehog is extremely susceptible to foot and mouth disease, and also that it is conveyed by contact between one hedgehog and another as with ordinary farm stock. The committee have thus been provided with an experimental animal of great value. The immunity experiments, though complicated, are interesting and lead to two possibilities for the future. If an effective serum or vaccine, which can be safely administered in the field as a protective measure, can be produced, the Ministry will be provided with a valuable weapon for use on the occurrence of an outbreak to mitigate the effects of the present slaughter policy. Further, the production of a vaccine inducing a combined immunity would enable importing countries to introduce measures of immunisation calculated to reduce the risk of virus coming over with chilled and frozen meat.

Crop Diseases

All those who have to do with cultural aspects of agriculture will be interested in Dr. Brenchley's article in the May issue of the Journal of the Ministry of Agriculture. The author is doing valuable work at the Rothamsted Experimental Station and her observations on the subject of crop diseases and their relation to changes in farming practice are important. Dr. Brenchley has come to the conclusion that the deficiency diseases of crops such as brown heart of swedes and heart rot of sugar beet are more prevalent than they used to be. A consideration of these things leads to a realisation of the need for correct fertilisation of the soil. Various obscure diseases are controllable or preventable by traces of boron, manganese, copper, and zinc among other substances. Ordinary farmyard manure contains a great variety of elements, and its use maintains the necessary supply of those nutrients which, although required only in small quantities, are vital to the good health of plants and the wholesomeness of the soil. The modern tendency to replace nature's own manure by artificial fertilisers now produced in great purity is a menace, because the soil is not receiving that little bit of something that did it good. It is of paramount importance that any signs of deficiency diseases of plants should be looked for and the cause determined and the missing nutrient supplied. It is useless to add all sorts of chemicals indiscriminately. A man in good health does not imbibe draughts of all the decoctions in a druggist's shop, and when he is not well he only partakes of such as prescribed by his doctor. So should it be with plants.

Grass Drying

When we wrote in September, 1933, about drying plants for conditioning both fodder crops and corn, there were those who thought us to be somewhat eccentric and rather optimistic. The recent paper by Lieut.-Colonel Pollitt before the Royal Society of Arts on the subject would, however, indicate that the silaging of grass is now an accepted procedure in British agriculture. Colonel Pollitt is one of a few farmers who have operated a grass drier for two complete seasons, and he maintains that, with artificial drying, a farm can be self-supporting in foodstuffs and that grass is preeminently suitable for drying. An acre of grassland, farmed well, will easily produce 10 cwt. of protein and 40 cwt. of starch in a season. When one contrasts these figures with other crops one realises what an important advance has been made. If the ground is allowed to produce hay in the old-fashioned way the protein per acre is only 2·7 cwt. and the starch 9·3 cwt. Oats, including grain and straw, only yield 2·6 cwt. of protein and 17·3 cwt. of starch per acre. Colonel Pollitt's figures are not on the high side. At the Hannah Dairy Research Institute in Ayreshire, 16 cwt. protein and 65 cwt. starch were obtained per acre. Animals fed on dried grass grade well, and the quality of the meat is the same as that from pasture fattened cattle. The working costs while still high are not prohibitive and with increasing numbers of plants the cost will fall.

The STORAGE of FOOD for the EMERGENCY of WAR

FIG. 1.—A cold store in which meat, offal and butter are stored in the same room. There is a danger of taint in butter due to uptake of odours from the different kinds of meat.

By
John J. Piqué

This special communication deals mainly with the cold storage of different kinds of foodstuff, the stocks of which may be increased to form a reserve against the eventuality of war. The length of life in storage, maintenance of the highest possible quality and appropriate conditions of storage for the different foodsuffs are discussed in the light of the most recent scientific discoveries

THE QUANTITY of each particular kind of foodstuff to be kept as reserve against a state of emergency can be calculated, assuming a certain length of time the state of emergency would last. The quantity having been ascertained, provisions have to be made to have this quantity available in the country at any time. But each foodstuff of animal and vegetable origin kept in cold storage has a definite limited length of storage life, so that the "reserve" has to be disposed of and replenished periodically.

By storage life is understood the maximum length of time during which a foodstuff can be kept at the degree of quality which makes it acceptable in the food market in peace time.

The length of time during which some foodstuffs can be kept under proper storage conditions is shown in the table on page 188.

From the two factors, the length of the storage life and the quantity of the particular foodstuff normally consumed in a given district, can be computed the maximum quantity which could be stored as periodically renewed reserve for the particular district.

Consider, for instance, a district where the normal consumption of frozen beef in peace time is 50 tons per month. The normal storage life of this commodity is 9 months, so that the periodically renewed reserve should not exceed 450 tons of frozen beef. And this example brings out two points:

(*a*) Available cold storage space should not be filled indiscriminately with large stocks of certain kinds of foodstuff.

(*b*) The length of time a state of emergency *could* last is determined by the storage life of foodstuffs if we had to rely on cold-stored food only. It should, however, be remembered that in case of emergency frozen foodstuffs could be kept longer than the periods shown in the table by lowering the storage temperature. At the same time "rationing" would be imposed, so that in the case of the instance above the 450 tons of frozen beef would last over a period of about 14 months.

The Care of Stored Foodstuffs

Foodstuffs to be stored have to be initially of first class quality; no method or means of storage will improve the quality of foodstuffs initially poor or defective. The first

care therefore lies in the production side. It is essential to pay careful attention to the influence on the foodstuff of ante-mortem factors mentioned in Fig. 4 on page 185 relating to animal products, and of pre-storage factors relating to vegetable products. The ignorance of some producers with regard to these factors is appalling, and the education of producers is urgently needed.

The length of the storage life of foodstuffs is also determined by the process of treatment prior to storage, the storage temperature, the degree of fluctuation of temperature, the relative humidity in the storage chamber, the method of packing and stowage, the composition of the storage atmosphere and the degree of infection. The diagrams on page 185 show the inter-relation of the various factors influencing storage life.

Deterioration of foodstuffs and spoilage have to be avoided not only in case of emergency, but at any time. Whilst the diagrams show the importance of temperature and humidity, let me sound a warning note against accumulating reserves in any old cold store. I have met managers of cold stores who had no conception of the exact meaning of relative humidity, who used hygrometers which were very much "out," and regarded a certain percentage of foodstuffs in store having gone mouldy and spoiled as a usual occurrence. In many stores I have visited, cheap thermometers were in use which were several degrees out when calibrated against a standard thermometer.

The management of many cold stores also do not seem to have any knowledge of the factors inducing and causing taint in different foodstuffs (see Figs. 3 and 4).

The Storage Atmosphere

The composition of the storage atmosphere has, in recent years, proved to be a main factor governing the storage life of foodstuffs. A few instances may be mentioned.

The addition of carbon dioxide, up to about 10 per cent., to the air in chilled beef stores has added the few extra days required to enable beef to be brought in chilled condition from Australia to this country.

Carbon dioxide greatly delays the development of rancidity in prolonged storage of bacon.

Carbon dioxide plus reduced nitrogen and oxygen prolong the storage life of eggs in shell.

Carbon dioxide plus reduced oxygen extend the storage life of certain fruits.

Volatile substances given off by fruit at the stage of ripening at which the aroma is developed break the "dormancy" of unripe green fruit and cause it, as in the case of bananas, to go into the stage of yellowing and sweetening.

The rot by Pencillium on citrus fruit can be controlled by critical dosage of ammonia gas in the storage atmosphere.

Controlled doses of sulphur dioxide can double the life of table grapes.

Suitability of Storage Chambers for "Gas Storage"

Storage chambers in which the composition of the atmosphere is regulated and controlled are known under the general term of "Gas Stores." Experiments on the storage of foodstuffs in air to which a proportion of certain gases is added have shown that it is impossible to maintain the required composition of the storage atmosphere in stores of the usual commercial construction.

As most gases readily permeate through the building materials and insulation used in storage plant, and as this loss of gas is accentuated by changes in barometric pressure and by the movement of the storage atmosphere by fans, it is obvious that all walls, floor and ceiling of a gas store have to be lined with material impervious to gases, such for example as steel sheeting.

The holds of a few beef-carrying ships have recently been fitted with an inner chamber to form a CO_2 gas-tight chamber. There is a certain amount of leakage in all of them which during the journey is made up by gas from cylinders, the leakage not being too great to make the cost of gas excessive.

During the last few years a number of gas-stores have been erected in this country for the storage of fruit, such as apples, all of more or less small capacity. An easy and inexpensive method of lining the stores with galvanised steel sheeting has been adopted (Fig. 6), as the

FIG. 2.—Consignment of mixed foodstuffs in a cold store. Rabbits are stored together with cases of salmon, megrims and other fish. The danger here is of the rabbit flesh taking up the odour of fish.

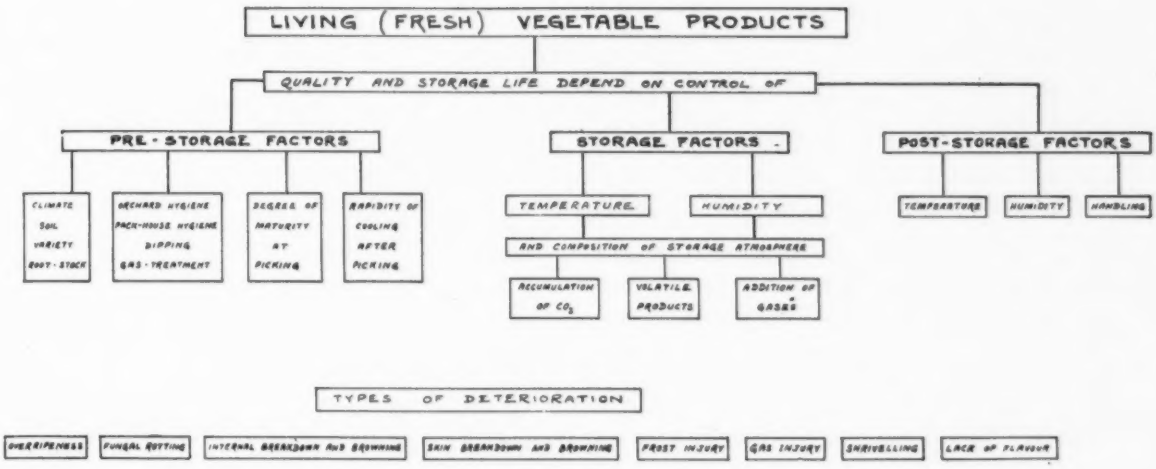


FIG. 3.

requirements for these stores are that they should be 95 per cent. gas-tight. That means that if CO_2 is blown into the storage chamber till the atmosphere contains 10 per cent. of the gas, the leakage by diffusion under working conditions should not amount to more than 5 per cent. over 24 hours—*i.e.*, the atmosphere should not contain less than 9·5 per cent CO_2 after 24 hours. But few of these so-called gas stores actually come up to the standard of gas-tightness.

Obviously this type of construction is not good enough for storage plant in which high concentrations of gases are required as for the storage of different kinds of meat, eggs, etc., or for plant in which meat, butter, cheese, fruit, etc., are gas-stored in different chambers, or for plant in which different kinds of fruit and vegetables are stored in different chambers, since diffusion of gas or volatile substances from one storage chamber into the other may completely upset the storage life of foodstuffs held in adjacent chambers. The stores must be perfectly and completely gas-tight. The following observations will make this clear:

1. Apart from mass movement of the storage atmosphere by means of fans in order to maintain a uniform temperature, gas leakage is in direct proportion to the difference in pressure of the gas on either side of the walls of the storage chamber. In a store in which, say, bacon is kept in 100 per cent. carbon dioxide, if such a store were leaky the cost of gas to keep up the required concentration would be very high.
2. If a bacon store with 100 per cent. carbon dioxide

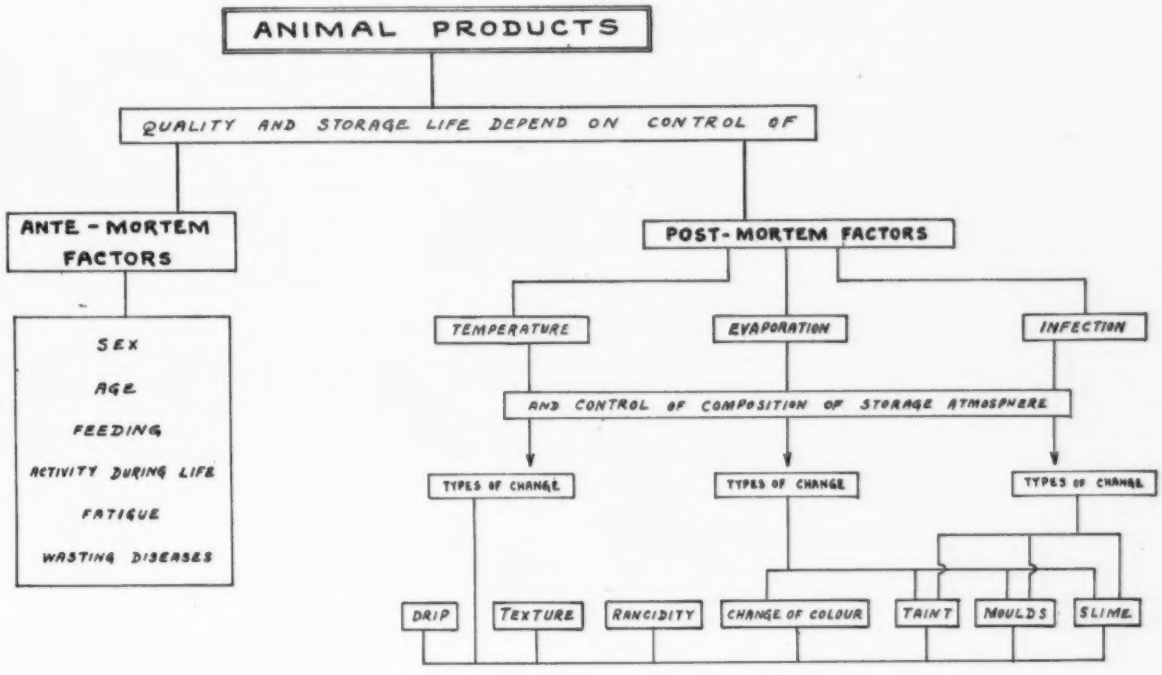


FIG. 4.

were adjacent to a beef store in which the optimum carbon dioxide concentration allowable is 10 per cent. leakage of carbon dioxide into the beef store would spoil the appearance of the beef.

3. Volatile substances given off by apples, pears, citrus fruit, etc., are readily taken up by butter, lard, meat fats, etc., causing taint.
4. The air from apple stores if passed over bananas causes rapid ripening; if passed over potatoes it causes abnormal sprouting or wartlike growths.
5. Storage in reduced oxygen or reduced nitrogen contents, as required for certain fruits, would not be possible in a leaky store.
6. In general, regulation and control of the composition of the storage atmosphere would not be possible in a leaky store.

Effects of Gases and Vapours on Foodstuffs

There are many gases and vapours which have marked physiological effects on foodstuffs stored in closed spaces, for instance, ammonia, carbon dioxide, oxygen, alcohol vapours, ethylene, ozone, aldehydes, sulphur dioxide, volatile products of fruit, etc. Many other gases are known to have a marked deteriorating effect on foodstuffs, such as Lewisite, chlorine, mustard gas, phosgene, chlorpicrin, etc. The effect of many gases, vapours, and volatile products on the texture and quality of foodstuffs is yet unknown, or has not been published.

Now assuming that a food storage plant has been subjected to aerial bombardment and has been badly damaged, not much damage by actual destruction could be inflicted on foodstuffs of a solid or semi-solid nature such as meats, fruit, vegetables, etc., and though the foodstuffs would be superficially soiled a large percentage could be salvaged from the wreckage. But if the aerial bombardment included gas-filled bombs holding gases of a powerful food-spoiling nature, the destruction of the foodstuffs might be complete.

Further, if such gases were of the heavier than air nature, their diffusion through the walls of the food storage chambers which had not been damaged would cause spoilage of the foodstuffs in the chambers. Such spoilage would not, however, occur to the same extent if each chamber in a storage plant were impervious to gases; if, for instance, they were lined with steel sheeting in a gas-tight manner.

Effecting Gas-Tightness

I have been responsible for developing a standard method for effecting gas-tightness of cold stores. The construction necessarily differs according to the particular foodstuffs to be stored; if the storage chamber is normally to be used as a gas-store for eggs, meats, etc., in which the composition of the storage atmosphere and the humidity have to be controlled, then the construction is not the same as for a cold store which is simply to be made gas-tight against leakage of food destructive gases from outside.

I do not think it necessary to build cold storage accommodation underground; damage by aerial attack to foodstuffs in gas-tight cold stores would not, in my opinion, be extensive.

It has been suggested that we should store tinned and canned foodstuffs only, but these commodities occupy about double the space of the raw material. Gas-tight cold stores divided into economic units for certain foodstuffs may in a way be regarded as huge tins, and would afford adequate protection against gases. Tinned goods should be stored at 34° F. to minimise wastage and losses resulting from hydrogen swells, perforations, chemical changes in general, corrosion, sulphur blackening, etc. Although tinned goods keep for a considerable period they would have to be disposed of after a certain time.

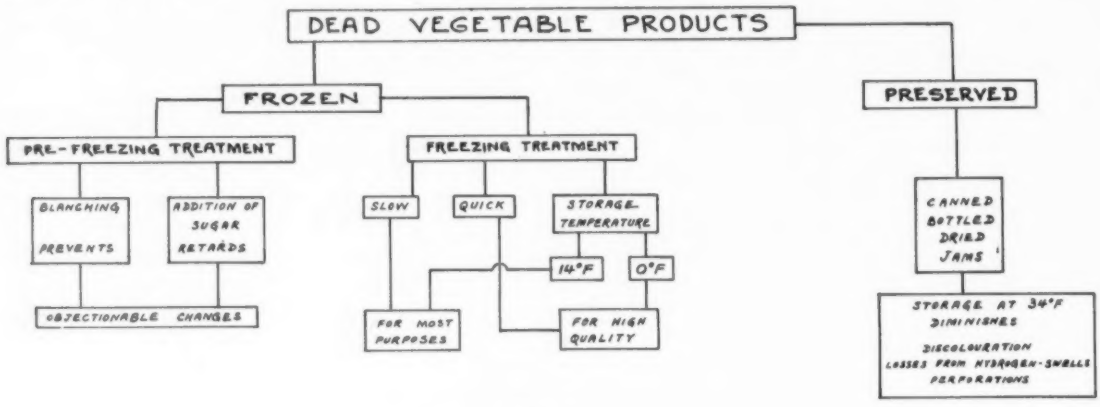


FIG. 5.

Advantages of Steel-lined Cold Stores

Apart from protection against food destructive gas attack, steel-lined cold stores present other advantages over the usual type of cold storage, namely:

(*a*) They can be used for "gas storage" of the actual foodstuff in order to extend the storage life.

(*b*) All internal surfaces of the store are non-absorbent; this minimises the evaporation and desiccation of the foodstuffs.

(*c*) No mould and fungus will grow on the internal surfaces of the stores (mould growth on the

FIG. 6.—Gas store for fruit. This illustration shows the method of lining cold stores with galvanised steel sheeting to render it impervious to gases, free from growth of moulds, absorption of odours, etc.

walls and ceiling of many commercial stores is quite common; it is obvious that the spores are carried by the air currents, infecting the foodstuffs and causing spoilage, to be avoided not only in cases of emergency but at any time).

(*d*) The internal surfaces of steel-lined stores being non-absorbent do not retain the odour of foodstuffs which would taint another kind of foodstuff stored subsequently.

All existing storage chambers do not lend themselves to conversion into gas-tight stores due to the type of cooling. For instance, a cold storage plant in which several chambers are cooled by cold air circulation through ducts from a central cooler would have to be altered as the air delivery and return ducts form means of communication between the storage chambers.

Machinery

The refrigerating machinery of a food storage plant of any size comprises several compressors, motors, pumps, etc., which for economic running are all fitted in one engine-room. This is the vulnerable part of the storage plant, and could, in many cases, be completely put out of action by one or two bombs. I would suggest the duplication of the refrigerating machinery, the duplicate plant to be fitted a proper distance from the original plant. Duplication may not be necessary in all cases; it depends on the kind of foodstuff stored. Some foodstuffs, when taken out of store or when refrigeration ceases, keep in good condition much longer than others. Therefore, in cold store premises where it is really impossible to find space for a duplicate plant, only such foodstuffs should be stored which keep in good condition for an appreciable time after storage.

Attention should be given to possible damage to the foodstuffs by the actual refrigerant used in the plant if the cooling pipes or connecting pipes were damaged by enemy attack.

There are two main types of cooling—*i.e.*, brine and direct expansion. Damage to foodstuffs by brine would be local and would not be extensive. In direct expansion-cooling ammonia and carbon dioxide are the only two gases used in plant of any size. Most foodstuffs would suffer damage from ammonia escaping in large quantities from burst cooling pipes.

Existing Cold Storage Accommodation

Let us now consider the efficiency of the food storage accommodation available in this country. There are some 450 cold stores for foodstuffs holding a total capacity of about 750,000 tons of various kinds of foodstuffs. It has only been possible to obtain information on 141 cold stores: of these

40 cold stores of a capacity of 65,770 tons were opened between the years 1888 and 1900.
38 cold stores of a capacity of 58,820 tons were opened between the years 1900 and 1910.
35 cold stores of a capacity of 30,000 tons were opened between the years 1910 and 1920.
28 cold stores of a capacity of 19,000 tons were opened between the years 1920 and 1925.

The machinery of some of these older plants has been replaced between 1911 and 1920, but in many cases the insulation is the original material.

What is the efficiency of the refrigerating plant and of the insulation of these old stores?

It is impossible to state the efficiency of the machinery without tests, or to estimate it roughly without knowing the state of repair, but in general it can be taken that as compared with present-day types of new refrigerating plant, the efficiency of the older plant is appreciably lower.

Lower efficiency, translated into coal consumption, transport of the coal required, man-power to mine and handle the coal, etc., become of serious importance in case of emergency.

With regard to the efficiency of the insulation, from the state of the material which the writer has noticed in some stores, it must be concluded that if tests were carried out quite a number of stores would not obtain Lloyds' R.M. Certificate. Defective and inefficient insulation mean more work for the refrigerating plant, more power consumed, more coal consumed.

A further important point is that in case of emergency

it may be necessary to keep certain foodstuffs in storage for a prolonged period. It is well known that certain foodstuffs will keep in good condition for a few weeks in storage at, say, 18° to 20° F., but if the storage has to be extended five or six months or longer the same foodstuffs should be kept at a temperature of 0° to −5° F. from the beginning of storage and, further, that the freezing treatment prior to storage be carried out rapidly enough at the required low temperature. All varieties of fish, for instance, have to be so treated.

There are no commercial cold stores for foodstuffs in this country in which temperatures of the order of −5° F. are maintained.

Conclusions

There is no justification in supplying the population with second-class quality food because there is a state of emergency; the supply of first quality food has a far-reaching psychological effect.

Various suggestions have been put forward regarding accumulating an adequate stock of food supplies at all times and regarding keeping the quantity more or less at the required level while catering for current consumption in peace time. In a letter by Mr. Kenneth Lightfoot, published in *The Times* of July 31, 1936, it is pointed out that "it has been computed . . . that the public cold stores of this country are, on the average, only filled as to one-third of their total capacity throughout the year and, that being so, space for, say, 300,000 tons of frozen meat lies available if the Government gave attention to the co-ordination of such service." The writer, however, would suggest that before stocking available space with reserve supplies of foodstuffs a survey of all the storage plant be carried out to ascertain the efficiency of the machinery and stores, their best use for the storage of various kinds of foodstuffs for prolonged periods, their conversion into gas-proof storage chambers, etc. Further, the duplication of machinery should be considered, the duplicate plant to be fitted either some distance away from the existing plant or in a less vulnerable position.

The reserve food supply should be organised with a view to the future; all storage plant should be periodically inspected, and should at all times be kept in good repair and efficient in performance. All plant and stores should come up to a required standard.

Cold storage conditions, which may be found "good enough" during the ordinary course of peace time business, when there is a relatively quick turnover, are not necessarily the type of stores to be used for the nation's reserve.

Food reserves should only be kept in stores suitable for the particular kind of foodstuff and so equipped that the foodstuffs can be kept therein for the maximum length of the storage life without any spoilage.

Food reserves should only be kept in stores under management who have adequate technical knowledge of food storage.

All food stores should be impervious to gases.

The three photographic illustrations accompanying this article have been kindly supplied by J. and E. Hall, Ltd.—ED.

Commodity.	*Storage.*			*Storage Life.*
	Temperature (° F.).	*Relative Humidity (Per Cent.).*	*Atmosphere.*	
Fresh Meats.				
Beef	29-31	79-81	Air	36-40 days
Beef	31-32	80-82	10% CO_2	45-55 days
Pork	27-29	80-82	Air	12-15 days
Lamb and mutton	28-30	82-84	Air	12-15 days
Veal	28-30	82-84	Air	12-15 days
Live s and hearts ...	27-30	82-84	Air	10 day
Sausages	26-28	80-82	Air	10 days
Frozen Meats.				
Beef	10-12	60	Air	9 months
Pork	5-10	56	Air	7 months
Pork	5-10	56	100% CO_2	10 months
Lamb and mutton	10-12	60	Air	9 months
Veal	10-12	60	Air	9 months
Livers and hearts ...	10-12	60	Air	6 months
Smoked and Pickled Meats.				
Bacon (cured) ...	10-12	60	Air	3-4 months
Bacon (cured) ...	5-10	56	100% CO_2	10 months
Ham (pickled) ...	5-10	56	Air	4 months
Tongue	27-30	82-84	Air	5 months
Sausages	28-30	74-75	Air	1½ months
Poultry and Game.				
Chickens	30-32	75 80	Air	12 days
Geese	30-32	75-80	Air	10-12 days
Turkeys	30-32	75-80	Air	12-15 days
Ducks	30-32	75-80	Air	10 days
Poultry (in general)	30	80-82	80% CO_2	6 weeks
Poultry (frozen) ...	10-12	60	Air	10 months
Rabbits	30-32	80-82	Air	12 days
Rabbits (frozen) ...	5-10	60	Air	9 months
Fresh Fish.				
Cod	In ice	—	—	16 days
Haddock	In ice	—		16 days
Wh ting	In ice	—	—	16 days
Plaice	In ice	—	—	16 days
Brill	In ice	—	—	16 days
Halibut	In ice	—	—	16 days
Herring	Iced	—	—	2-3 days
Brine-frozen Fish.				
Cod...	0 to −5	—	Air	10 months
Plaice	0 to −5	—	Air	10 months
Halibut	0 to −5	—	Air	10 months
Herring	-6	—	Air	6-7 months
Smoked Fish.				
Kippers	0 to −5	—	Air	6 months
Bloaters	0 to −5	—	Air	6 months
Haddock	0 to −5	—	Air	6 months
Cod fillets	0 to −5	—	Air	6 months
Eggs.				
Eggs in shell ...	32	80	Air	5-6 months
Eggs in shell ...	32	95	CO_2 and N	8-10 months
Liquid eggs ...	10	—	—	9 months
Milk Products.				
Milk	33	—	—	20-25 days
Cream	5-10	—	—	2-2½ months
Powdered milk ...	28-30	—	—	2-3 months
Condensed milk ...	31-32	—	—	5-6 months
Butter (fresh) ...	28	80	—	25 days
Butter (frozen) ...	0-5	—	—	6 months+
Cheese	33-50	76-84	—	1-3 months

(*Continued on page* 189.)

PAPRIKA

The Central European Condiment

MUSTARD, prepared as we know it, is seldom seen in Central Europe, although it may be forthcoming in the larger international hotels and in the homes of resident British families. Pepper, too, is less used, and is much less potent on the Continent than here. The place of mustard and pepper is largely taken by paprika, a sweet but very hot red pepper.

The paprika, served as a condiment, is the product of milling the ripe fruits of one or other of the varieties of *Capsicum annuum* or *C. frutescens* (N.O. Solanaceæ). So far as Central Europe is concerned, it was reported as growing in Moravia in 1585, having presumably been brought from Spain, where it is still extensively cultivated and used under the name of *pimenton*. It is supposed to be a native of Central America, from where it was brought to Spain in the fifteenth or early sixteenth century. The present centre of cultivation is Hungary, from which country most of the world's supply originates, although neighbouring countries have recently taken up the growing of capsicum in order to meet their own requirements. Thus, it is cultivated in Northern Jugoslavia, and this year some 4,000 acres were planted in South Slovakia to produce fruits for grinding at the mills in Nové Zamky, Nitra and Zvolen, which previously relied mostly upon imported fruits.

For successful growth paprika requires a rather rich soil. In Hungary the soil is on the light side, made friable by constant working and enriched with cattle dung. The plants need plenty of sun, and naturally do best in a warm season. There are usually from 6,000 to 15,000 plants to the acre, according to whether they have been planted out or sown directly. During milling 100 kilograms of the fruits yield about 18 kg. of sweet red pepper. Several grades are distinguished according to quality, mode of grinding and origin. The qualities considered best come from Szeged and the Kalocza districts of Hungary.

Not only is paprika used as a condiment in place of pepper or mustard, but it is used as a flavouring, especially in such dishes as Hungarian goulash, a meat dish very popular throughout Central Europe. Another local speciality is "Filled Paprika," prepared from the ripe (red) or green pods, from which the seeds are removed and replaced with force-meat. Its sharp, hot flavour stimulates secretion of gastric juices and so aids digestion.

The taste is so pronounced that it is still discernible at a dilution of one part in eleven million parts of water. The active principle of capsaicin (capsicin, capsicol), $C_{18}H_{28}O_3N$ (? $C_{18}H_{27}O_3N$), which is present to the extent of only about 0·02–0·05 per cent. (varying with different grades) and which can be extracted as colourless needle crystals of m.p. 63° C., is soluble in organic solvents (ether, alcohol, etc.) but practically insoluble in cold water. In addition, paprika contains a wax, a resin (used externally in plasters) and a volatile oil with an odour reminiscent of parsley. The red colour is due to an anthocyanin pigment, capsanthin, $C_{40}H_{58}O_3$, present to the extent of about 0·13 to 0·5 per cent.

That the green pods are rich in vitamins A and B has been known for many years, and has been shown from experiments on rats and pigeons. More recently (1934) Professor A. Szent-Györgi discovered that paprika was exceptionally rich in vitamin C, which he was able to extract and identify as ascorbic acid.

J. G. F. D.

CONTAINERS for HONEY

THE United States is trying to standardise its honey containers, according to the latest technical news bulletin of the U.S. Department of Commerce. The reason for this move is a general feeling that the tremendous variety of shapes and sizes of honey packs does not tend to increase sales.

The agreed standards of 1933 were revised in 1936 according to programme, and it is now recommended that stock containers of 24 and 48 oz. capacity be included in the schedule. These sizes will replace the existing pint and quart packs.

The trade also appears to be interested in a standard stock size of 32 oz.

The Storage of Food for the Emergency of War (*continued from previous page*)

Commodity.	*Storage.*			*Storage Life.*
	Temperature (°F.).	*Relative Humidity (Per Cent.).*	*Atmosphere.*	
Fruit.				
Apples	34-40	85-90	Air or CO_2	5-6 months
Blackberries ...	0-5	—	Air	9-10 months
Grapes	35	—	Special	6 months
Lemons	38-42	82-84	—	20-30 days
Oranges	34-42	82-84	—	2½ months
Pears	33-37	83-88	Air or CO_2	1-4 months
Plums	34-40	76-80	—	2-6 weeks
Soft fruit (frozen) ...	0-5	—	Air	9-10 months
Vegetables.				
Brussels sprouts ...	33-34	80	Air	5-10 days
Cabbage	32	78	Air	2½ months
Carrots	34	78	Air	2-3 months
Celery	33	78	Air	2 months
Leeks	35	80	—	8 days
Potatoes	38	78	Air	4-5 months

PROGRESS IN FLAVOURING ESSENCES

by H. Stanley Redgrove, B.Sc., F.I.C.

Flavour perception, new essences from tropical fruits, drink flavours, and artificial nut flavours, are described in this article, the author indicating that improved transport facilities invariably bring new products into greater demand.

THERE IS kinship between flavouring essences and perfumes. Flavour perception is an olfactory phenomenon rather than one of taste proper, and many raw materials —synthetic aromatics—are common to both the flavouring essence and the perfumery industries. Nevertheless, there are points of difference, two of which are of considerable commercial importance.

It is well recognised that the human nose, in spite of its shortcomings as compared with the olfactory powers of many animals, is more sensitive than the chemical balance. Differences in the composition of perfumes too small to be detected by chemical means can be smelt. But in most folk the flavour sense is more acute than the sense of smell proper; and defects in flavours which do not obtrude themselves when the product in question is merely smelled, are not infrequently revealed when it is tasted. This means that the task of the flavouring essence manufacturer is more difficult than that of the perfumer.

Training Flavour Perception

Of course, the sense of flavour perception can be trained. Tea-tasters can detect differences in the flavours of teas which the general public would pass unnoticed. Connoisseurs of wines can, after a sip or two, name the vintage.

Training may take place in the reverse direction. Eating an ice on the Continent, one naturally looks for little black specks in it, evidence that it has been flavoured with genuine vanilla. In this country, a large section of the public has been trained to accept as the flavour of vanilla that of coumarin touched up with vanillin. Such downwards training is not in the true interests of the food industry. It is more profitable to train the public to appreciate a superior article and to be prepared to pay for it.

A second important difference between perfumes and flavours is that novelty in flavours makes little or no appeal to public taste. It is true that part of the perfumer's energies are directed towards the production of imitations of the odours of well-known flowers; but there is a big and growing demand for perfumes of an entirely "fancy" type—odours which please in much the same way as compositions by such musicians as Debussy, Scriabine and Stravinsky please. Novelty constitutes their appeal, rather than their resemblance to anything we have ever smelt before.

There is nothing analogous in the realm of flavours. To be appreciated, a flavour must resemble that of a well-known fruit or other esteemed natural product. Hence, progress in the flavouring essence industry is represented mainly by a series of small improvements, and not by the creation of novelties.

Tropical Fruits

It may seem a far cry from aerial transport to flavouring essences; but aerial transport is responsible in part for the fact that a number of tropical fruits are now available in this country, in an edible state, which were either very scarce or quite unobtainable in the past. These new fruits are not yet quite common enough for a demand to have sprung up for synthetic flavouring essence simulating their flavours. But it is a domain to which flavouring essence manufacturers might well turn their attention. Something has already been attempted as concerns passion-fruit, and as the public become better acquainted with litchees, mangoes, custard-apples, etc., a demand may well arise for confectionery and fruit drinks having the flavours of these fruits.

One tropical fruit which is now very abundant on the British markets is the banana; yet some readers will be able to recall the time when this fruit was something of a novelty. The banana aroma recalls that of amyl acetate, and Kleber (*Am. Perf.*, 1913, **7**, 235), by steam distillation of the fruit, obtained a volatile oil from which he was able to obtain amyl alcohol and acetic acid by means of saponification, thus proving that amyl acetate was an actual constituent. Used alone, however, amyl acetate proves a very poor imitation of the banana flavour and needs very careful blending. Definite advances, judged from samples handled, appear to have been made in imitating this flavour, at least one British-made artificial banana flavouring giving very excellent results in chocolate cream centres and the like.

Soft Drink Flavours

As flavourings for soft drinks, Citrus fruit flavours are most in favour. Lemon heads the list, with grape-fruit as a rival which has increased enormously in popularity in recent years, owing, perhaps, to the fact that it blends so admirably with gin. Lime, too, is having a spell of popularity partly for the same reason, and partly be-

cause of the reputation it has of being a "slimming" agent. Orange is also in demand; and the recent Abyssinian war created a serious shortage in Sicilian orange oil. This was met by skilful blending on the part of several British firms, the products being noteworthy in point of excellence. Oranges and other Citrus fruits are now being grown in many parts of the world, including parts of the British Empire. Is it not possible that with improvements in cultivation and technique the superiority of the Sicilian oils will become a thing of the past?

A hitherto rather neglected fruit flavour to which attention has been directed by one British firm is the mulberry. It is doubtful, however, whether mulberry flavouring essence will prove popular, unless the cultivation of the tree can be encouraged. This has fallen into abeyance. Of the present-day public, many have never tasted a mulberry, and of those who have, quite a fair proportion are almost certain to have forgotten its flavour.

Artificial Nut Flavours

Progress has recently been made in the production of artificial nut flavours, such as those of the walnut, hazelnut, and coconut. Apart from the almond, whose flavour can be imitated by means of synthetic benzaldehyde, and possibly even better by means of tolylaldehyde, little is known concerning the actual aromatic constituents of nuts. However, research has eventuated in the discovery of suitable materials for imitating a number of nut flavours, the practical results of which are available for the use of manufacturers of confectionery, etc., even if the theoretical results have not been made public.

A point of interest in connection with progress is the fact that flavouring essence manufacturers are becoming increasingly aware of the fact that a common fruit name such as "apple" or "pear" covers a great variety of flavours; and just as the manufacturer of perfume bases will offer a variety of compounds all of the rose type, but each imitating the odour of a particular variety of rose, so are the ranges of flavouring essences being enlarged by the inclusion of varieties of a specific fruit flavour. Perhaps the sweet-eating public is not in general a very discriminating one; but manufacturers of high-class confectionery should not ignore the varied differences obtainable by means of modern flavouring essences.

Essence Grading

One final point: reputable manufacturers of flavouring essences are usually very scrupulous in the labelling of flavouring essences according to source. The usual method of grading is as follows: (*a*) Essences derived solely from the fruit or other natural product after which they are named; (*b*) blended essences derived from fruits or other natural products only; (*c*) blended essences based on synthetics.

This practice is highly commendable. Manufacturers of confectionery, soft drinks, etc., are not always so scrupulous, and sometimes approach perilously near the line of misrepresentation. This is not as it should be. People ought to know what they are eating and drinking. The law in this country is lax; and the practice of taking full advantage of its laxity is likely to eventuate in its being stiffened up considerably. This might have a good effect on public health; but it would not be welcomed by many food manufacturers.

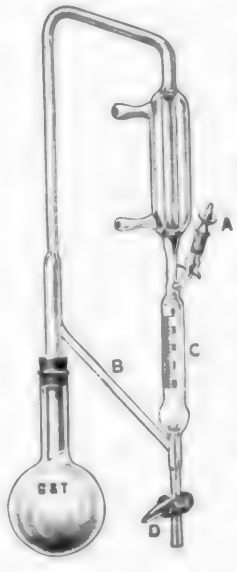
MOISTURE DETERMINATION

Improved Distillation Method

THE water content of "air-dry" drugs is relatively high, and satisfactory results are not always obtained by chemical methods of determination or by simple drying, and special apparatus has been devised by Griffin and Tatlock, Ltd., whereby the moisture content can be rapidly and accurately assessed by distillation.

The sample and about 50 ml. of an appropriate extraction liquid (tetrachlorethylene B.P. 121° C. or carbon tetrachloride B.P. 77° C. are usually suitable and non-inflammable) are introduced into the 100 ml. flask. The syphon tube B and the graduated tube are filled with the solvent from a pipette via the ground-in stopper A, which is only loosely inserted to provide an air vent, a slip of paper being inserted between the stopper and its seating. A rubber band is hooked round the glass horns.

The contents of the flask are then heated and as distillation proceeds an aqueous layer separates and collects in the graduated tube and the excess of (denser) extraction liquid is returned to the flask by the tube B. Estimation is usually complete in 15-20 minutes, after which the volume of the collected water is read. It may be necessary to remove a little of the solvent through the draining cock D in order to bring the water meniscus to a convenient point on the scale.



The apparatus has an overall length of about 16 in., and includes a 100 ml. flask with cork. The graduated tube reads to 4 ml. in 0·1 ml. Flasks of larger capacity may, if desired, be used.

Commercial Production of FRUIT SYRUPS

by

Vernon L. S. Charley,
Department of Agriculture and Horticulture, Long Ashton, Bristol.

A view of the temporary building for fruit products work at the Long Ashton Research Station, Bristol. The picture shows stacks of experimental syrups and a filtration operation on fruit juice in progress.

DURING THE summer of 1932 the first season's work on liquid fruit products was commenced at Long Ashton by the writer. Each succeeding year the experiments have been either repeated, expanded or elaborated, and given considerable publicity from time to time in this Journal. The initial aim was to discover products which would involve the use of the maximum amount of fruit, whether by incorporating the highest possible proportion of fruit in the final products or by producing a liquid food with a somewhat lower fruit content which would be so attractive to the consumer that its enhanced sales would compensate the fruit-growing community for the reduction in fruit content. It was very soon obvious that in several types of products the fruit content could not be reduced below a certain figure without causing an almost complete loss of fruit character. Further, an equally important point has been elucidated concerning the amelioration of flavour in products with a fruit content so low that the fruit character is not sufficiently penetrating. No means of economical sophistication have been discovered at Long Ashton or accepted by the writer from a mass of material of a pure or synthetic nature which a large number of firms have sent to the station for examination.

The question naturally arose at a crucial stage of the fruit products developments, in the spring of 1935, "Whither fruit products research?" Should it be devoted to the furtherance of efforts to make a given quantity of pure fruit juice stretch to the utmost limit, or, on the contrary, to continue to investigate the possibilities of producing a range of products which would fully warrant the title of "pure fruit products" and which would contain the maximum possible amounts of fresh juice?

Nothing daunted by the almost complete absence of any signs of commercial utilisation by manufacturers of the earlier research work, largely on the grounds that pure fruit products could not and would not stand on their own feet and compete with existing products, the Long Ashton Department concerned with the investigations pressed on with its original task and, as is now well known, elaborated a cold process for the manufacture of pure fruit syrups which, in the summer of 1936, was adopted for a very large-scale commercial production.

Syrups

The earlier work at Long Ashton indicated the serious alterations made in the flavour of liquid fruit products by the application of heat. Concentration *in vacuo* was shown to minimise the bad effect, but even in very high *vacua* the effect on the highly acid juices was still notice-

able. Pasteurisation, again, "deadened" the fresh character of the fruit, and imparted to the syrup a "cooked" taste which was more reminiscent of fruit jam than of the fresh berries. It should be emphasised that the additional "cooked" flavour is not complained of as being unpleasant, but merely that it removes some of the clean attractive fresh fruit character and replaces it by a heavier flavour of a quite dissimilar type.

The development of a cold process consequently involved the storage of the fruit product in some form other than a heat concentrate, and as the freezing concentration process is still not considered to be in a sufficiently advanced state for large-scale use, it was decided to store the whole of the commercial bulks of fruit juices in the form of syrups. It will be obvious that this decision meant the provision of over ten times the storage capacity that would be needed for the same bulk of fruit juice when reduced in bulk to a concentrate, but the syrup process involved the least possible alteration in the fruit juices, and consequently the products should have retained their flavour and aroma to the maximum degree.

Syrups *v.* Concentrates

There is one rather important technical difference between syrups and concentrates. In the case of an acid fruit such as the raspberry, the acidity of the juice would normally be about 1·5 per cent. (as citric acid). A 1 : 6 concentrate would have an acidity of 9·0 per cent., whereas a pure syrup with 55 per cent. sugar would contain only 0·8 per cent. citric acid. The concentrate, protected by the very high acidity, would most probably be perfectly stable, whereas the syrup might need a slight increase in acidity to enable the chemical preservation to be fully effective. But, in the event of both products being broken down with water, the raspberry concentrate would eventually be much too acid for consumption as such, and would need treatment for acidity reduction, whilst the syrup would be rather sub-acid. It is, however, much easier to increase acidity than to reduce it by chemical means, and naturally reduction merely by the addition of water cannot be considered as a possibility. For this reason syrups represent the means of storage which causes the least possible alteration to the flavour and condition of the fruit material. It is interesting to note in this connection that some syrups which were purchased were neutral to litmus, although they were labelled with the name of a fruit whose average acidity was 3·0 per cent. citric acid. No attempt is made to explain such an occurrence, but as it was not an isolated case, and as the true fruit flavour was entirely absent, manufacturers who were considering the production of a pure syrup approached the Ministry of Agriculture with a view to the introduction of a National Mark scheme for this type of product to afford the pure fruit products some distinguishing feature for marketing purposes.

National Mark Scheme

The salient features of the scheme which was introduced in time for the 1936 soft fruit season were as follows:

(1) The fruit material used must be produced from clean fruits grown in the United Kingdom.

(2) No sweetening substances other than sucrose, invert sugar or glucose to be used.

(3) In the case of a finished product which bears the name of one particular kind of fruit, the flavour shall be identifiable as that of the fruit used.

(4) *Select Fruit Juice Syrup.*

(*a*) The product shall be made from fruit juice of a specific gravity of not less than 1·030 at 60° F., to which dry crystallised cane sugar or dry hydrated glucose shall be added, or of a specific gravity of 1·035, to which liquid invert or liquid glucose containing not more than 16 per cent. by weight of free water shall be added.

(*b*) The gravity shall lie between 30°-65° Brix. "Heavy" syrups shall be above 55° Brix.

(*c*) Acidity of syrup shall be not less than 1·0 per cent. as citric acid. Pure fruit acids may be used to attain this figure, but in such cases the acidity shall not exceed 1·5 per cent.

(5) *Select Fruit Juice Syrup.* (Milk shake grade.)

(*a*) As 4 (*a*) above.

(*b*) The gravity of the finished product shall be between 50°-55° Brix.

(*c*) The use of the finished product with milk in the proportions generally accepted by the Milk Bar Trade shall not cause obvious precipitation of casein.

This scheme has been given in some detail, as it is considered to be of much significance and importance. The prospective manufacturers of the pure fruit syrups were determined not to commence manufacture without the safeguard of some distinguishing hall-mark of quality on their product, which would be conferred by the introduction of a National Mark scheme. The regulations were drawn up entirely by the Ministry of Agriculture, but the firms involved made it abundantly clear that there could not be too high a standard set for the National Mark syrups. It will be seen that the juice content of the syrups is not specifically stated. Indeed, this will vary with the density of the syrup, but the various regulations do afford a definite guarantee that the juice content for any given syrup will be as high as possible. For example, if a 53° Brix syrup is being made, each gallon of juice will yield approximately 1·7 gallons of syrup, and consequently the juice content of the syrup is 60 per cent. With a heavy syrup, such as 68° Brix, the juice content will be 43 per cent., whereas with a 30° Brix product the juice proportion rises to 80 per cent.

The control of the scheme involved periodic visits to the factories and checking of records, whilst samples were taken at frequent intervals and examined in the light of the regulations.

Pure *v.* Synthetic

The question of the nomenclature of labels is an important one when fruit syrups and juices are being considered. An outspoken article by Mr. C. Paget Norbury in a recent contemporary contained the following statement. After pointing out the facilities that exist for an expansion of the fruit products trade, he says: "But—and this, I believe, is why the industry does not develop still further—there is nothing to prevent a manufacturer making a synthetic or semi-synthetic product labelled 'Genuine fruit juice' or 'Prepared fruit juice' (products which contain no foundation of real fruit), and this, of course, is done". And again: "The majority of milk bars are now using synthetic fruit syrups for their milk shakes, and the Milk Marketing Board is powerless to stop it. This, in time, will doubtless react upon the sales of milk, and so the dairy industry as well should be interested in seeing that standards are adopted". Finally, "We, as fruit growers, should insist that the National Mark standard should be compulsory for all cordials. . . ."

Purity Standards

The extreme importance of the introduction of adequate standards is enhanced in the case of these new fruit products with high juice contents by the very fact that their manufacture has only recently been commenced, and that the imposition of standards is more satisfactorily effected at the preliminary stage of a new industry than later on when the industry itself may have adopted other criteria. During very recent weeks the Editorial of *Food Industries Weekly* has contained some very cogent remarks concerning the need for a more widespread adoption of food standards through the agency of the National Mark, and the above paragraphs certainly bear out the contention as it affects the new syrups.

The food value of pure fruit syrup is such that their consumption as thirst-quenching beverages represents only one of the possible outlets. They have been effectively converted into jellies (by cold or hot method), used as cake fillings and icings, and in a number of other ways by expert confectioners and pastrycooks. Consequently, in concentrated or diluted forms, these are of equal interest to the food manufacturer and the producer of beverages.

Technical Developments

The above paragraphs have indicated some of the difficulties that have faced the pioneer manufacturers of these syrups. But great progress has been made. During the summer of 1936 over 55,000 gallons of pure fruit syrups were produced in one factory alone, every gallon of which was accepted for the National Mark. Other outputs of varying amounts were made in the fruit-growing areas, and despite many difficulties which inevitably occurred during the season, the cold process was eventually used satisfactorily for probably the largest bulk of syrup ever prepared in this or any other country. There can be no doubt whatever that the products themselves are improvements on the small-scale samples which were previously prepared at Long Ashton. A full report of the manufacturing details will be published in the Annual Report of the Research Station which will be published in June, and consequently actual details will not be discussed here. Some features, however, of last year's research work may be of interest.

Retention of True Fruit Flavour

Earlier experiments showed the necessity of keeping a high sugar content in the syrup to achieve satisfactory retention of the characteristic fruit flavour. Now, the stability of the syrup is directly correlated with the sugar content if no preservatives are used, and although a 65° Brix syrup will be fairly stable and retain to a remarkable degree the fruit character, it has the great disadvantage of being too sweet. Consequently it was decided to determine at what point the reduction of sugar concentration commenced to affect the flavour retention. The results, which have only just been obtained, indicated that 45° Brix syrups made from strawberry, black currant and cherry had lost an appreciable quantity of their flavour, whilst a 30° Brix strawberry syrup was quite unrecognisable. Raspberry and loganberry syrups were less affected by the reduction of sugar, but the tendency was noticeable even in these cases. The ideal sugar concentration appeared to be about 50 per cent., for there was no appreciable loss of "fruitiness", and such syrups were much more highly flavoured than the heavier 65 per cent. products.

It was interesting to note that strawberry juice which had been maintained in an unfermented condition for eleven months by Seitz E. K. filtration had completely lost its characteristic flavour. Indeed, it had changed, as is the case in strawberry wine, into a flavour reminiscent of the aromatic character of sherry.

Varietal Effects—Vitamin C

Although at the moment the manufacturer of fruit products must generally take the varieties of fruit which happen to be available, and these generally in an entirely mixed condition, it was considered desirable to determine whether any single varieties of some of the soft fruits were more satisfactory than others for syrup production.

The results for flavour were not sufficiently convincing to be reported here, but the analyses of the fresh juices from the single varieties of fruits indicate some most interesting and important data.

The specific gravity figures are low for strawberries and some raspberries, as fermentation had set in before analyses could be effected. But in every case the alcohol found in the fruit at the time of analysis was sufficient to account for an amount of sugar which indicated that the absolutely fresh fruit juice would have had a gravity equal to or greater than 1·030. With the small samples of black currants it was not possible to obtain a gravity of the fresh juice, but figures obtained from the large bulks of juice for the factory processes were about 1·051-1·055.

Acidities varied to some extent, but no outstanding features were encountered.

ANALYSES OF FRESH FRUIT JUICES, JUNE-JULY, 1936

Fruit.	*Variety.*	*Specific Gravity.*	*Acidity as Per Cent. Citric Acid.*	*Vitamin C. mg./ 100 c.c.*
Strawberry	Royal Sovereign	1·024	0·82	52·9
,,	Tardive	1·020	0·96	40·0
,,	Oberschlesien	1·020	0·88	64·0
Raspberry	Lloyd George	1·025	2·20	22·5
,,	Preussen	1·023	1·86	24·7
,,	Viking	1·033	1·84	32·6
,,	Duke of Cornwall	1·025	1·77	25·9
,,	Norfolk Giant	1·016	2·18	20·8
Black Currant	Baldwin	—	3·40	161
,, ,,	Boskoop	—	3·20	132
,, ,,	French	—	2·86	178
,, ,,	Westwick	—	2·91	147
Blackberry	—	1·032	1·97	—
Gooseberry (Average)	—	1·045	2·02	27·3
Cherry	—	1·064	0·82	trace
Red Currant (Average)	—	1·035	2 40	44

The vitamin C data, however, contained some important figures. The very high ascorbic acid content of black currants has been known for some while, and quite recently Olliver[1] has examined the whole fruit and confirmed the high values. The Long Ashton data show that the fruit juice itself is also a rich source of this accessory food factor. If the averages for lemon and orange juices are taken as 65 and 55 mg. per 100 c.c. of juice respectively, the preponderance of ascorbic acid in the black currant juices is easily seen. Strawberry juice is a less potent source, but does actually contain important quantities of vitamin C. Data are not yet available for the retention of ascorbic acid by the syrups, but there are indications from the results already obtained that the retention is considerable. Elaborate series of experiments have been commenced to determine the factors influencing the loss of ascorbic acid during long storage of syrups and concentrates.

Fruit Squashes

A canning firm made some quantities of squashes from English soft fruits in 1936 and there has been a very good demand. The flavours are generally more intense than those of the corresponding syrups, for no filtration is needed and a considerable amount of fruit tissue is allowed to remain in the juice.

Sparkling Fruit Juices

The technical details of the production of a fruit juice similar in condition to an aerated water is probably not of interest to readers of this journal. But the underlying marketing organisation that it is hoped to adopt is of importance, as it represents a new development in quality and price control. The National Association of Mineral Water Makers have been considering the possibility of finding some product which can be bottled under standard conditions with a guaranteed quality and stability, and which can be marketed nationally under strictly controlled price agreements. It is hoped that when negotiations are satisfactorily completed the scheme will comprise the enforcement of the quality factors by the use of a specially prepared National Mark scheme, whilst the price arrangement, failure to comply with which would involve the cutting off of supplies of syrup base, will be the concern of the Mineral Water Trade Association. In this way the consumer would be able to procure National Mark aerated beverages of identical character all over the country, and whilst he will be protected by the imposition of a standard price, the retailer and producer will reap the benefit of the enforced absence of any cutting of price.

Although the National Mark scheme is not yet completed, the sale of the beverages on a non-National Mark basis has been commenced, and over 220 bottlers are now using the National Mark syrups for the production of a series of very attractive beverages.

REFERENCE

[1] Olliver, *J. Soc. Chem. Ind.*, Vol. LV, No. 24.

General view of the laboratory premises at the Long Ashton Research Station, Bristol.

NEUTRALISATION of ACIDITY in MILK by ELECTRICAL MEANS

THE publication, in our May issue, of an article on the sterilisation of milk by high and low frequency currents, etc., gives added interest to the electrical apparatus, devised by "Elact", of Vienna, for the neutralisation of milk by means of an electrolytic tank, modified to suit the necessities of milk treatment.

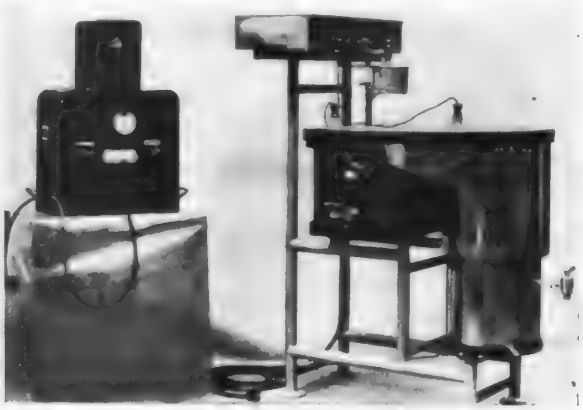
It consists of a vat in glass or porcelain in which are placed the two electrodes. These are generally of aluminium, but some workers prefer carbon for the positive electrode. At the bottom of the vat an entrance tube for the milk is placed, and this is connected to the milk intake vat immediately after the filter on the incoming milk pipe.

The milk coming in at the bottom passes over the electrodes and, when the vat has been filled, it runs over the side into a smaller vat, from which it is run off to the pasteurisers. The electrical treatment causes a very slight heating of the milk; this, however, is no inconvenience. What is more so is that a certain amount of froth is formed during the process, and that a slight deposit is formed on the positive electrode.

The electrodes are fed with a direct current produced by a small rectifier placed in a separate cabinet from the vat, and which steps down the current. This cabinet has on its face the necessary controls for regulating the flow of current through the milk and thus the speed of acid destruction can be determined.

Experimental workers admit that they do not as yet completely understand the phenomenon that is produced. It seems, however, that the current passing through the milk destroys the acid by electrolysis much more rapidly than it does the water content of the milk. It has, in fact, been possible, by suitable regulation of the strength of current and the speed of passage of the milk, to reduce the acidity of the milk to zero, and even to obtain an alkaline milk.

The electrolysis of the acid causes a formation of gas which rises at the electrodes and causes the formation of froth, which has been noted. This formation, however, is no greater than that in other dairy apparatus such as centrifugal separators. The solid precipitate on the electrode, which amounts to about 0·1 per cent., has possibly a similar explanation.



The "Elact" apparatus described above.

The question of the material from which the electrodes are made arises because, during the process, if aluminium electrodes are used, the milk will after treatment be found to contain about 0·00195 per cent. of aluminium. Chemists point out that some milks naturally show traces of aluminium and that this content presents no disadvantage, but for greater security some workers prefer to avoid the use of aluminium altogether.

The machine has a particular interest in large dairying installations where, especially in summer, milk is sometimes found which is too acid for pasteurisation and has to be used for animal food, neutralisation by chemical means being generally forbidden. The process has, so far as can be discovered, no effect either on the nutritive value of the milk or on the enzymes or vitamins present.

GRADED FOODS

AN interesting little pamphlet entitled *The Consumer's Guide on how to Buy Graded Foods* has recently come to hand. Published by direction of the Dominion Minister of Agriculture at Ottawa, Canada, it is intended chiefly for the use of the housewife as a help toward intelligent buying and economic catering. A summary is given of such foods as are graded according to the standards established by the Dominion Department of Agriculture, and such provinces in which legislation has been enacted to supplement that of the Federal (or Dominion) Government, making the grading compulsory. An idea as to the extent to which this phase of consumer protection has been carried may be gleaned from the following items listed in the guide.

Eggs are sold in four quality grades, and each of the three best grades is subdivided into further classifications of weight or size. While the sale of poultry by grade is not compulsory, such practice is generally established in the larger centres. Five grades obtain, denoted by a tag with a distinctive colour to indicate the grade to which the bird belongs. For canned fruit and vegetables the words "Fancy", "Choice", "Standard", and "Second" denote the quality and consistency in size respectively. Peas are additionally graded as to size from No. 1, the smallest. Honey is classified into four grades by colour, each colour quality being further divided into three grades, of which (*a*) absence of wax specks or other foreign material, (*b*) flavour, and (*c*) density, are the factors which determine them.

Thus, providing she takes the trouble, the housewife is assured of being able to get what she pays for. But such is human nature that those to whom they should be of greatest interest are either in ignorance of the existence of the grades or are too careless to take the trouble to identify them. Nevertheless the idea is gaining ground and the principle, sound as it is in the protection it gives the careful shopper and the responsible manufacturer or producer alike, might well embrace a wider field of application.

COLOURS for FOODSTUFFS

Their development and manufacture up to the present-day standards of purity

An aerial view of the works of Williams (Hounslow), Ltd., makers of colours for foodstuffs.

ONE IS easily apt to say to-day that there is nothing new in colours for foodstuffs. There have been no new colouring matters announced during the past year since we devoted space specially to matters concerning the colouring as well as the flavouring of foodstuffs.

New uses for colours in foodstuffs are, however, continually being found, and these new uses give rise to very specific demands, which have to be met by the makers of these harmless colours. Colours for use in edible products have to conform to the highest possible standards of purity, and in order to maintain or, if possible, to improve upon these high standards, constant testing and research by the manufacturers is necessary.

To learn more of what colour makers are doing for the food industry, we recently paid a visit to the works of Williams (Hounslow), Ltd., who this year, incidentally, are celebrating the sixtieth anniversary of the foundation of the company. The company is the successor to the original firm of Williams, Thomas and Dower, which was founded by the late Charles Hanson Greville Williams, pupil of Hoffmann and assistant to Perkin, the pioneer of the dyestuffs industry, in partnership with Edouard Thomas and John Dower. Their factory was established at Brentford under the name of the Star Chemical Works, and it was a few years later, in 1877, that the two elder sons of the original founder established themselves at a factory at Hounslow.

A Scientific Foundation

Greville Williams himself discovered several basic dyestuffs that are used to-day in various industries, and ultimately became a Fellow of the Royal Society, but the great association of the firm of Williams Bros. and Co. (as it was then styled) with the food industries began with the demands for colours for the confectionery trade, from which beginning they developed a wide range of edible colours guaranteed to be harmless.

Naturally the demand for these colours in the early days was small and the quantities manufactured were correspondingly so, but as the demand increased the size of the batches produced was enlarged until to-day the production of harmless colours for edible purposes is a very important branch of this firm's undertaking. Two colours that are particularly well known in the food industry —*i.e.*, Tartrazol Yellow and Nigrosine—are manufactured by Williams (Hounslow), Ltd., on a very extensive scale; in fact, we understand they are the only makes of edible Nigrosine in this country. Tartrazol Yellow is used for so many different purposes, amongst them lemonade, custard powder, cake flour, boiled sweets and fondants, jubes, jellies, etc., that the demand throughout the world is large and orders for quantities of one ton are not infrequent. Carmoisine and Azo Rubine (or Amaranth), used as red colouring agents in all manner of cordials, jams, jellies, and confectionery, are amongst other colours which we found were sold in relatively large quantities.

Maintaining High Standard of Purity

The secret of success in producing colours of the high purity demanded for use in foodstuffs, which, as we have already said, has made it possible to meet the requirements of food manufacturers and of the Food and Drugs

A typical view inside the works showing plant used in Nigrosene manufacture. (*Cromwell Studios, Ltd.*)

(*Left.*) Mr. H. H. Lovely, Managing Director of Williams (Hounslow), Ltd. He entered the service of the company in 1894.

(*Right.*) Mr. A. G. Kemp, assistant to Mr. Lovely. (*Cromwell Studios, Ltd.*)

Act, lies in close control at every stage in the process of manufacture. This is achieved by manufacturing these food colours in special departments of the factory which are reserved for this purpose and in comparatively small batches in contrast with the large bulks of commercial dyestuffs made in other parts of the factory. These smaller batches can be much more closely controlled, and it is this intimate control which is so essential in the production of these pure products.

Williams (Hounslow), Ltd., have large laboratories installed for works control, service, and research purposes, and all batches are carefully tested by the control laboratories before they are passed into stock as ready for sale. In one of the control laboratories all foodstuff colours are carefully tested to determine the content of arsenic, lead, copper, and other deleterious impurities and to ensure that each batch passed for sale conforms to specification. Whereas the accepted limit of arsenic content is 1·4 parts per million, the figures obtained are almost invariably under 1 part per million, and constant vigilance is necessary to achieve such a record. Another of the control laboratories is engaged in checking the shade and strength of each batch, as it is most essential in the foodstuff industry (where small differences in shade show up so greatly in use) that supplies should be absolutely uniform, and no effort is spared to this end.

The service laboratory is concerned in experimenting with customers' own materials, in helping to meet their requirements, to supply new shades, and to solve any problems that may be presented to them. This is a very valuable service of which users of colours for foodstuffs may well take advantage.

Trials on Human Beings

In the course of the development of food colours, Williams (Hounslow), Ltd., decided to arrange for the colours principally in use for foodstuffs to be subjected to tests on human beings under scientific control and medical supervision. The late Dr. Samuel Rideal, F.I.C., F.C.S., undertook the work, the results of which were published in the *Lancet*. Various dyestuffs were administered to human beings and animals and the general effects upon them and their assimilation and excretion were watched. Observations were made three times daily on body weight, rate of pulse and respiration, and temperature. The urine, fæces, and blood were also examined, so that the investigation was thorough in every way. Much larger quantities than would be commonly consumed in any food were administered.

The general conclusions reached were that the colours under test, when taken internally, cause no physiological disturbances, and are therefore harmless in the quantities used for colouring foodstuffs.

A glance at the aerial view of the works of Williams (Hounslow), Ltd., shows the size to which the company has developed from a small beginning. We were particularly struck during our tour of the works with the amount of entirely new installations and improvements still in progress.

We are indebted to Mr. A. G. Kemp, who is assistant to Mr. H. H. Lovely, the Managing Director, for his courtesy in showing us round the works.

SPOILAGE of CANNED GOODS

THAT refined sugar is a frequent carrier of "flat-sour" bacteria, the thermophilic "sulphide spoilage" organism, and, on occasion, of gas-forming thermophilic anaerobes, are the conclusions of E. J. Cameron in *Food Industries*, April, 1937. Figures are given which show, in general, that most of the "certified" sugar is of suitable bacterial quality. Experimental corn packs, in which sugar contaminated with flat-sour bacteria was used, show that any bacteria from suitable sugar were destroyed by the 70-minute process. But 95·8 per cent. of cans containing unsuitable sugar were not sterilised. Even after 90 minutes at 250° F., more than 50 per cent. had not been sterilised.

The use in corn of sugar contaminated with thermophilic anaerobes showed that with a 90-minute process at 250° F., which is 20 minutes over the recommended process, there was a 25 per cent. spoilage. The most striking result of this work was the occurrence of all three types of thermophilic spoilage during incubation at 98° F. Beyond this, there has been the contrast which has been emphasised in sugar experiments. In the significant processes of 60 and 70 minutes at 250° F., no spoilage occurred with the "no-starch" or "low count" batch. The "high count" starch, however, induced spoilage in both processes. While the contamination of sugar and starch is established, spoilage has been traced to flour of one type or another in spaghetti, beans, and chowder. And such ingredients as dried milk and mushrooms have been suspected of causing spoilage in creamed soups.

COLOURING MATTERS IN DAIRY PRODUCTS

In this article W. L. DAVIES, Ph.D., D.Sc., F.I.C., of the National Institute for Research in Dairying (Reading), describes the source and properties of both natural and synthetic colourings commonly added to milk products. The synthesis of carotene to Vitamin A in the liver of cows is discussed.

THERE ARE two classes of colouring found in dairy products: (*a*) the natural colouring matters which are normally present in cow's milk—namely, carotene and lactochrome—and (*b*) colouring matters added in the course of manufacture, such as annatto in butter and cheese, and various synthetic colours for ice-cream, or in synthetic fruit flavours for milk-fruit juice mixtures. It is obvious that the naturally occurring pigments play some part in the physiological and nutritive value of milk and its products, while the second class of pigments are added to satisfy the public demand for a uniformly coloured or a more invitingly coloured article of food. The rinds of some cheese, notably Edam cheese, are covered with wax containing a fat-soluble pigment in solution. This combines the property of preventing moisture loss from a comparatively small cheese with appeal and distinction of the particular type of cheese so treated.

Natural Colouring. Carotene

Ordinary whole milk is white to a slight creamy white in colour. On pasteurisation the colour tends to become "dead white". This militates against the appeal of milk as a beverage since one of the reasons given for the non-drinking of milk, especially by children, is its "cold-white" colour. The increasing sale of milk in various forms in milk bars, etc., is partly due to the modification of milk by mixing with coloured fruit juices of both the synthetic and natural types.

When cream is allowed to rise in milk the colour of the layer is distinctive. The pigment dissolved in the fat is concentrated and a creamy layer of varying intensity of colour can be observed. If the cream is churned so that the fat-in-water emulsion is changed to what is mostly a water-in-fat emulsion, the exposed fat now shows the yellow colour of carotene, which is in solution in it. If again the butter is melted and the fat allowed to settle as a layer above the butter serum, the clear golden colour of carotene is shown at its best. Cow's butter fat thus contains carotene. All the carotene of milk (as also are the vitamins A and D) is dissolved in the fat and thus there is no carotene in skim milk and its products.

Other Milks

The cow is the only species of mammal which secretes carotene in her milk regularly; some samples of human and mare's milk have also been found to contain carotene, but the pigment is absent from buffalo and sow's milk. The ghee (rendered butter fat) of the buffalo is a non-coloured fat product.

The carotene content of cow's butter fat varies considerably with the food of the animal and the breed. The transference of carotene from the food to milk fat has been the subject of considerable investigation since carotene is the precursor of vitamin A, and can, under conditions of deficiency of the vitamin, be quantitatively converted into the vitamin. The pure pigment can be administered instead of the vitamin, and since the pigment can be isolated in a pure state and dissolved in various inert oils, it has been used as a standard of vitamin A in feeding experiments.

Source of Carotene

The cow, however, has the capacity of storing large quantities of carotene and vitamin A in the liver, from which small quantities of both materials are doled out into the milk fat during secretion. The source of carotene for the animal is green food, and when that food is available, storage of carotene occurs in the liver and the milk fat is rich in the pigment. A period of time on a diet deficient in green food depletes the carotene in the liver and the amount in the milk decreases. In the latter periods of winter feeding it is quite possible for butter prepared from milk produced then to have but a faint yellow colour, which can only be overcome by feeding carotene-rich foods. The colour of the butter is soon restored by pasturing cows on fresh green grass in spring.

Carotene and Vitamin A

The economic value of carotene lies in its transformation to vitamin A in the liver of the cow. There is little, if any, vitamin A in the green food of a cow's diet and the property of the liver to synthesise the vitamin from carotene is important; the cow, however, in contradistinction to other mammals, transfers both carotene and vitamin A into the milk; it must, however, be understood that although other mammalian milk fats contain no carotene, they contain a considerable amount of the colourless vitamin A. The colour of the milk fats of the various breeds of cows also varies appreciably; this does not mean that the total vitamin A activity of such butter

fat varies with the colour. It means that the distribution of carotene to vitamin A in the milk fat is a breed characteristic; the vitamin A plus vitamin A equivalent of the carotene is, under parallel conditions, roughly constant for butter fat from all breeds. The butter fat from the Channel Island breeds of cattle is highly coloured, but the vitamin A activity does not differ from that of butter fat from Ayrshires fed under identical conditions (Guernsey butter fat contains twice as much carotene as Ayrshire butter fat). Some cows also give a higher yield of butter fat per day. Guernseys give a high yield of highly coloured fat, but Friesians giving less, of a lighter colour, secrete not only more vitamin A in the same weight of fat, but the total vitamin A activity of the fat per day may be as much as 20 per cent. greater than the total activity of the fat of the higher-producing animals.

Butterfat Colour in Winter

Since it is the nature of the diet which defines the carotene content of the butter fat, the investigations concerned with colour have consisted mostly of preserving in some way the carotene content of green grass and hay during storage. This has been done in two ways—namely, ensilage and quick-drying of grass. The preservation of grass by the dilute acid (A.I.V.) method has been found particularly valuable in this respect. The feeding of this silage at the rate of 40 lb. per head per day, or the inclusion of dried grass as 50 per cent. of the ration, raises the carotene content of winter milk to summer level. The carotene content of hay, even when well made, is disappointing owing to the destructive action of sunlight. The feeding of carrots as roots during the winter feeding period also causes butter fat to recover part of its carotene content; many factors, however, make this crop an uneconomical one to grow for dairy feeding.

Xanthophylls

Some of the colour of butter fat is due to xanthophylls, which are transferred to butter fat in amounts comparable with their occurrence in the food. These plant pigments possess no special nutritive value; they are more easily destroyed in the digestive tracts of animals.

Lactochrome

The water-soluble pigment in milk, which becomes more apparent in whey, is termed lactochrome (lactoflavin). The colour appears as a greenish-yellow fluorescence in whey. The pigment also confers on milk and its fractions, including whey, a strong greenish-yellow fluorescence under the ultra-violet lamp. It has been isolated by adsorption on fuller's earth from whey acidified to *p*H 4-5. The pigment is eluted from the earth with a methyl alcohol-water or pyridine-acetic acid-water mixture. The purified crystalline material (lactoflavin) has been prepared in a yield of 2 mgm. per 100 litres of milk.

The importance of lactoflavin rests in its probable identity with vitamin B_2; 0·005 mgm. of purified lactoflavin per day given to rats suffering from a deficiency of vitamin B_2 stimulates weight increases to those on normal diets. The amount of this colouring matter in milk varies with the breed, the Ayrshire breed giving over twice the amount of pigment than the Shorthorn for equal volumes of milk. Lactoflavin is not confined to cow's milk. Human milk contains it, and it is present in ewe's milk in greater concentration than in cow's milk.

Added Colouring. Annatto

This natural colouring matter is the aqueous extract of the seed of the tropical plant *Bixa orellana*. The commercial extract is marketed either in strong alkaline solution for cheese or other aqueous systems, or in alcoholic solution for butter and other fat systems. The colouring principle of the annatto seed is *bixin*, but the colouring agent present in commercial cheese annatto is the potassium salt of norbixin, the dicarboxylic acid derived from bixin. The acidity and alkalinity of the medium has a considerable effect on the colour, which in alkaline solution (the sodium salt) is yellow with a little red, but in acid solution (say at *p*H 5·5 as in cheese), the free acid, norbixin, is partly precipitated, and a reddish tint about half the tinctorial power of the soluble form is given by the residual colloidal solution. Working on the basis of Lovibond units of total colour (yellow and red), the red units account for only 37 per cent. of the total colour units at *p*H 6·0, but for 71 per cent. at *p*H 4·5.

Cheese Colouring

For cheese-making purposes, annatto solutions are standardised. Samples from different manufacturers, however, vary slightly in colour strength. This is accompanied by variations in the colour of manufactured cheese, which is a drawback in the trade. The amount usually used is $1\frac{1}{2}$ oz. per 1,000 lb. of milk, or a dilution of 1 : 10,700. The standard cheese colour diluted 10,000 times and determined in N / 10 caustic soda solution should have the following depth of colour: 4·0 Lovibond yellow units, 0·4 red units, and 0·1 neutral tint.

In the cheese-making process the added colour distributes itself between the curd and the whey, about $\frac{1}{10}$ of the colour only appearing in the whey. The curd is coloured to a depth which is proportional to the initial amount of annatto added to the milk, but in the ripening process, changes due to evaporation of moisture and increase in acidity cause the colour, especially the red fraction, to deepen considerably.

Chemical Properties of Annatto

The constitution of bixin shows that the compound is susceptible to oxidation and reduction, but the colour is scarcely affected by reducing substances—*e.g.*, SO_2 and H_2S. But annatto solutions are bleached rapidly by hydrogen peroxide solutions, and slowly in the air. Air entering into cracks in cheese can cause local bleaching of the colour. At the same time the fat in the bleached portions is in a more advanced stage of oxidation than

in unbleached areas, and oxidising fat has been found capable of bleaching annatto. Traces of copper accelerate the rate of bleaching under both acid and alkaline conditions, but iron only under slightly alkaline conditions. Old samples of annatto develop a precipitate accompanied by loss of colour. When such colours are added to milk in cheesemaking no difference in behaviour of the cheese colour in the ripening process is observed, although the precipitate acts as a catalyst to oxidation.

The "bleached", "pink", and "muddy" discolorations of coloured cheese are variants of the same defect due to a variable loss of colour through chemical action. The yellow colour is destroyed in preference to the red. Higher original concentrations of annatto increase the "pink" defect considerably.

Annatto in Other Milk Products

The addition of annatto to improve the colour of milk is prohibited as such a colour would give a false idea of the richness of the milk, and make a milk of low carotene content (or less coloured fat) simulate milk from Channel Island cows.

The Addition of Annatto to Cream

For the manufacture of butter the addition of annatto to cream is permissible, although this gives a false idea of the carotene content. There is, however, some evidence that *bixin* possesses vitamin A activity so that its incorporation in butter is of some nutritional value. Liquid cream, for sale as such, comes under the same ban as liquid milk.

The addition of annatto to milk for cheesemaking may be regarded as a means of producing an article of food of uniform colour for which there is considerable demand owing to the custom of certain classes of people in various areas always to demand coloured cheese. It can be said that the colour does not hide any defects in the taste and texture of cheese. The manufacture of processed cheese from coloured cheese gives an inviting article, although some trouble is met with occasionally from the "pink" discoloration problem mentioned above.

Other Colouring Matters

All permissible synthetic dyes which are generally allowed for colouring food products can be added to all milk products excepting milk and cream intended for sale as liquids. The dyes used in practice, however, consist of only a small range. They are added to supply a popular demand for a food product of inviting colour, the tint and depth being gauged from experience and usage.

Cheese Rind Colours

Some small cheese are coated with wax to avoid too great a loss of moisture during storage. The wax is sometimes coloured with a dye in order to distinguish the type of cheese and to make the appearance inviting. The Dutch cheese, Edam, is an example of this treatment. The dye must be fat-soluble, which naturally restricts the range of red dyes possible. Preference is given to colours of natural origin, and the dye in commonest use is the red extracted from alkanet root. Possibly owing to changes which may occur with coal-tar dyes in the ripening cheese, the use of such synthetic dyes is prohibited by law. Sudan III. has been experimented on and found quite satisfactory. The amount of diffusion of dye from the wax coating into the body of the cheese is very small, usually only to $\frac{1}{8}$ in.; the wax and coloured rind are usually discarded and the cheese is eaten in a fresh condition. The cheese is manufactured in the areas closely adjacent to Holland, and, although there is a federation looking after the welfare of the cheese, members are conservative with regard to the rind colour.

CONTROL of ROPE in BREAD

THE development of rope in bread has been for many years one of the most troublesome problems of the baker. The disease occurs in home-made as well as commercial bread. In a recent paper* work on the subject is described. Although rope has been definitely proved to be the result of bacterial spores, the sources of infection have never been clearly shown. The spores of these bacilli (*B. mesentericus* group) are very resistant to heat, and are able to survive baking temperatures and subsequently grow in the bread.

Other ingredients than flour, particularly yeast, malt and malted products are the chief sources of rope in America. The disease can be avoided by the selection of ingredients through careful laboratory control. A bacterial method of obtaining spore counts is described by the authors, who recommend that ingredients of unknown origin and characteristics should be given careful laboratory examination before being used in bread making. The presence of rope bacilli fluctuates, and it appears that improved methods of harvesting and milling American grains has had a beneficial effect on the flour as far as the bacilli are concerned.

* Hoffman, C., Schweitzer, T. R., and Dalby, G., *Ind. Eng. Chem.*, **29**, 464, 1937.

ORANGES and X-RAYS

BY means of X-rays the private life of the modest orange is now laid bare for all to see. With this new method the fruit passes through a machine at the rate of 22,800 per hour, and defects in pulp are revealed in a fluoroscope. To reject bad fruit, the inspector merely throws a lever; good oranges continue through, to be packed for shipment. This development, reported in detail in *Food Industries*, is of interest to manufacturers of all types of food who can readily adapt its principles to their own products.

AROUND THE INDUSTRY

Death of Major C. A. Mercer

It is with deep regret that we announce the death on Sunday, April 25, from pneumonia, of Major C. A. Mercer. Aged about 41, he was Works Manager and Director of the Purdy Patent Machinery Co., Ltd., joining Mr. P. J. Purdy immediately after the war.

Major C. A. Mercer.

Major Mercer had a distinguished career. Transferring to the Royal Air Force from an infantry battalion, he rose to be commander of a squadron, making something of a record for youthfulness in this way.

The funeral took place at the Crematorium, Golders Green, London, on Thursday, April 29.

Refrigeration Round the World

M. T. Zarotschenzeff, Vice-President and Technical Director of the Z Pack Corporation, New York, has just started on a round-the-world trip to study refrigeration in various countries. The journey will take about six months, and will include the refrigeration institute at Karlsruhe, the Fisheries Station at Wessermuende, the Low Temperature Research Station at Cambridge and the Torry Research Station, Aberdeen.

Citric Acid Shortage in Italy

It is reported by the American Vice-Consul at Palermo that the quantity of limes being processed in Sicily at present is only just sufficient to meet the demand for fresh juices; the quantity of lime citrate being made is negligible. There is no inducement to growers to make lime citrate instead of fresh juices, as the price they would obtain for the former commodity is fixed at last year's level. The shortage of citric acid in Italy is such that some 70 tons have been imported in recent weeks for their own requirements.

Provender Manufacturers Federate

The Provender and Compound Food Manufacturers' Federation has recently been formed.

Mr. J. W. Pearson (British Oil and Cake Mills, Ltd.) is the president, Mr. C. H. Rogers (W. H. and J. Rogers, Bedford) and Mr. H. B. Stone (Hodder and Stone, Bristol) are the vice-presidents, and Captain L. H. Green is the secretary of the Federation, whose office is at 52, Grosvenor Gardens, S.W. 1. Twenty-three of the large firms in the industry are included in the list of original members.

The Federation will send representatives to the Seed Crushing and Compound Cake Joint Industrial Council, which, it is expected, will be reconstituted and enlarged in order to admit of this wider representation.

Honour for Sir Joseph Reed

The University of Durham are at the end of June conferring the hon. degree of Doctor of Civil Law on Sir Joseph Reed, who, until 1925, had for many years been associated with the management of the *Newcastle Chronicle* publications.

He was the chairman of the first editorial committee of *Chemical Industries*, published by Leonard Hill Limited.

Peppermint

Following favourable results in the experimental cultivation of peppermint at Ter Haar in Southern Holland, growers now contemplate extending the acreage to produce a commercial crop.

Forthcoming Events

June 1.—"British Country Life throughout the Centuries Exhibition" under auspices of *Country Life*, in aid of National Trust, 39, Grosvenor Square, W. 1. All June.

June 2-12.—Empire Exhibition. Waverley Market, Edinburgh. Promoted by Overseas League.

June 25-26.—Society of Chemical Industry. Annual General Meeting at Stratford-on-Avon.

July 2-11.—Achema VIII. Chemical Engineering Exhibition. Frankfurt-on-Main.

Canners' Exhibition, 1937

The prospectus for the Imperial Fruit Show and Canners' Exhibition to be held at Bingley Hall, Birmingham, from October 20 to 28, has now been issued. It gives a plan of the floor space, specifications of uniform stands, rules and regulations, etc.

The Bingley Hall has a floor area of approximately 60,000 sq. ft., and a large area has been set aside for the exhibits of canners and manufacturers of canning machinery and appliances.

Communications should be sent to the Secretary, Imperial Fruit Show, 5, Bloomsbury Square, London, W.C. 1.

Paris International Trade Fair

There has been an alteration in the dates of this Fair, to enable it to coincide with the first week of the six-monthly Exhibition. The International Trade Fair, having opened on May 22, will now close on June 7, one week later than originally announced.

Mr. Harold Heron (seated nearest camera) and then round the table Mr. and Mrs. A. J. C. Cosbie, Mr. Alfred Potter, Dr. E. F. Armstrong and Mr. Olsen (standing) enjoying a rest and a drink during the Food Group's visit to Germany.

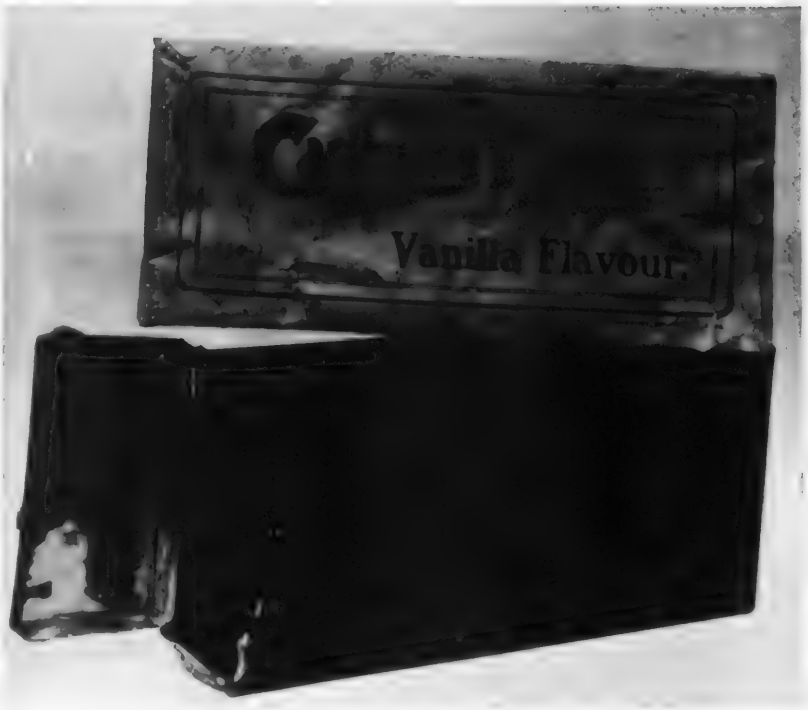
Huntley and Palmers get New Director and New Building

Mr. Neil Gardiner is the new director. The new building, constructed on four floors, is to be used for administrative purposes. On the ground floor is the room for the storage of old records, an interviewing room, buyers' offices, and the headquarters of the recreation club. On the first floor the board of directors and executive staff have their offices, on the second the wages and filing, and on the third the invoice and ledger departments.

The change-over of staff and equipment to the new block has now been completed.

Potato Bread

Potato bread is likely to be a familiar commodity in this country in the near future. The Potato Marketing Board has recently been experimenting, in an improvised laboratory, with a potato flour fit for human consumption, while at Wisbech a factory, owned by private enterprise and with a gross output of 230 tons per week, has produced a potato meal for use as cattle food. They have, however, been handicapped by the present potato shortage, and through this reason have been unable to work at full pressure, though the demand far exceeds the output.



Rising Food Prices

According to the *Board of Trade Journal*, wholesale food prices were 15·6 per cent. higher at the end of April this year than at the corresponding time in 1936.

The stand of the National Adhesives Corporation, featuring "Mikah" glues, at the Seventh Packaging Exposition organised by the American Management Association.

War-Time Chocolate

Twenty years after it was sent out from Bournville in the early days of the war, a tin of Cadbury's vanilla chocolate has been found at the bottom of Wellington Harbour, New Zealand (see picture above).

A boy bathing in the harbour with his mother noticed something on the bottom. He dived down and brought up the tin. They opened it with a tin-opener and ate two of the three tablets, which they found still pleasantly edible in spite of twenty years in the sea. As the photograph shows, the wrapper is of a design long out of date.

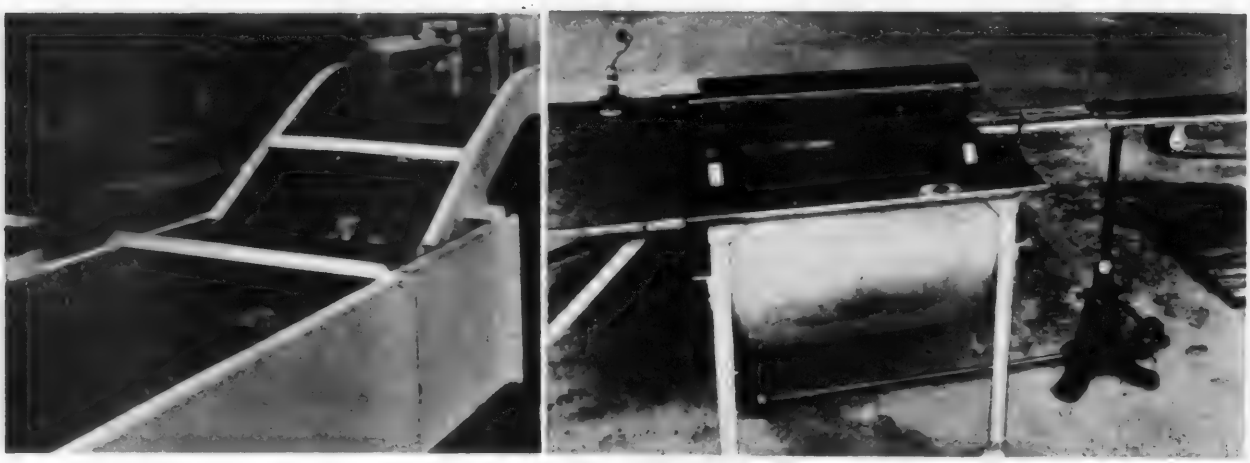
Congratulations to Cadbury's packing department appear to be in order!

Rust-Resisting Wheat

Six thousand bushels of a new variety of wheat, known as "Renown" and produced at a special laboratory at Winnipeg, are being distributed to farmers in the rust-affected areas of the Prairie Provinces. It is desired by the Government that the farmers should give it a fair trial and report next autumn as to its value.

Monel Food Equipment

Increasing use is being made of Monel metal in all branches of industry, and food manufacturers were among the first to appreciate the value of Monel equipment. An illus-



Two recent Monel Metal installations. On the left a brining tank through which fillets are conveyed upon a woven wire belt of Monel Metal. The wire mesh permits the fillets to drain before they are delivered to the picking tables. This tank is part of the plant of General Seafoods Corporation, Gloucester, Mass. On the right is seen a Monel Metal can drainer in the plant of James Marshall Toddington, used for mixing fruit salad. The cans are suspended and the fruit then sent to the blending tables. The syrup is drawn off and clarified. (Mather and Platt, Ltd.)

trated leaflet has just been issued by Henry Wiggin and Co., Ltd., showing recent Monel installations in food plants. They also offer a free technical advisory service to food manufacturers.

Canada's Expanding Canned Food Industry

An increase of 155 per cent. in the volume of production between the period of 1923-35 is shown by the Canadian fruit and vegetable preparation industry. It includes establishments engaged in canning and preserving fruit and vegetables, and those manufacturing cider, pickles, ketchup, sauces, and such products.

The total pack of vegetables for 1936, amounting to 9,241,575 cases, is the largest since 1930. In 1935 the vegetable pack was 6,045,782 cases. Estimates for canned fruits for 1936 are not yet available for all products.

Ozonised Ice

Tests in France have shown that ozonised ice as a refrigerant has given excellent results, particularly in connection with fish transport. The storage life of the fish has been lengthened by three or four days, as compared with the use of ordinary ice.

It is believed that the existing commercial ozonisation apparatus may well be adapted to the requirements of fishing vessels. This will then make it possible for the fish to be washed with ozonised sea-water immediately after the catch, thereby asepticising it to a large extent before packing in ozonised ice.

Preservatives in Sausages

A fine of 5s., with £2 2s. costs, was the penalty imposed on a London shopkeeper for selling pork sausages containing sulphur dioxide to the extent of 150 parts per million and not having declared the presence of the preservative.

Mr. Blakeley, for the Islington Borough Council, said that it was permissible to have preservative in sausages if a declaration were made. The amount of preservative in this case did not exceed that which the regulations allowed. At the time of purchase the defendant stated that the sausages were free from preservative. The defendant told the magistrate that she obtained the sausages from a wholesaler. She did not think he made them himself. They were described as country sausages, and she did not think about the matter really. They also sold larger sausages which did not contain preservative. She thought they were marked if they contained preservative. They were quite fresh.

The magistrate said that he did not see why people should not have what they asked for.

Marking Tin Cans

In labelling tin cans for storage or other purposes, trouble is often occasioned by the label becoming dirty, or, more frequently, coming off entirely. A suitable ink for writing directly on the can itself is given in the *Canning Age* for April, 1937.

Add copper sulphate to water until a saturated solution is obtained. A sharp pointed piece of wood like a toothpick or an ordinary pen can be used for writing. As this fluid is thin and has a tendency to run off the pen, it can be thickened by the addition of 5 per cent. gum arabic.

New Code Dating Machine

A new machine for code dating or numbering labels, wrappers, cartons, coupons, etc., has been placed on the market by C. C. Gibson. Amongst the advantages claimed for it are its rapidity and economy. The machine will date labels at the rate of 1,000 a minute and is simple in action.

Dating is effected by cutting a series of small notches in one edge of the label and can be read at a glance by means of the code.

To change the date, cutters are thrown into or out of action, the operation occupying only a few minutes. The machines are of robust design and will run for years without any repairs other than the occasional renewal of the cutters.

Other advantages claimed for the "Beam" system in addition to economy and speed are:

It does not cause adhesion of even the most highly varnished or gummed labels.

It does not disfigure the labels. The "notches" are adjustable for depth and can be reduced until they are not noticeable unless specially looked for.

It will handle work outside the range of other methods, such as small coupons and heavy cartons.

Spillers' New Mill

The new mill of Spillers, Ltd., at Newcastle, will be completed early in 1938. It is the first of its type in Europe and the highest mill in the world. Cargoes of wheat can be discharged into its silos at the rate of 150 tons an hour.

A feature is that the milling of flour and the manufacture of animal foods, dog foods and provender are carried out under one roof.

Welsh Tinplate Works Reopen

After nearly seven years of idleness the largest works in the Welsh tinplate trade are to be restarted almost at once. They are the Cwlfelin Works at Swansea, owned by Richard Thomas and Co., who control about 60 per cent. of the total Welsh output.

This new development in the revival of industry in South Wales is mainly due to the consistent growth of the home demand for tinplate consequent upon the expansion of the canning industry. Of the 21 mills in the Cwlfelin works four are to be placed in commission at first.

New Ice-Cream Cone

The thickness of the actual biscuit in the body and edge of the Ritz ice-cream cone is the same throughout, and every part of the cone is therefore baked to the same degree. The inner wall of the cone is flared, so that it forms a seat upon which the disher serving of ice-cream rests.

In addition, the stronger edge of the cone supports the pressure of the ice-cream, and the gutter serves as a trap for the melting ice-cream.

Ritz ice-cream cones are made by Facchino's Purity Biscuits, Ltd., Purity Works, Birmingham 8.

New I.C.I. Warehouse

A 13,000 sq. ft. warehouse is to be erected by Imperial Chemical Industries, Ltd., on the Team Valley Trading Estate, at Gateshead-on-Tyne. It will be of light steel framework, with 9-inch concrete brick walls, with road and rail links to main lines of communications.

Electric Battery Vehicles

A standardised plug and socket connection for these vehicles is announced by Wilson Electric, who themselves have supplied large numbers of these vehicles to distributors in the food industry. The new plug and socket has been carefully designed for the job; it has been accepted by the Electric Vehicle Committee of Great Britain and is being adopted by the British Standards Institute.

Society of Chemical Industry

Provisional arrangements have now been made for the Summer Meeting of the Society to be held at Stratford-on-Avon on June 25 and 26. Members will leave London on Friday morning, and the afternoon will be spent in a visit to the Perry Wood, Leamington, factory of the Metal Box Company. This company will act as hosts from 2 p.m. onwards. Transport has been arranged for the journey to the Chipping Campden research station on the Saturday morning. In the afternoon there will be an optional tour of the Cotswolds.

Further details may be had from the Society.

Corrosion of Iron and Steel

Wherever iron or steel is used corrosion is a problem that must be dealt with. One of the most up-to-date and versatile methods of rendering metal structures corrosion-proof is zinc spraying. A booklet on this subject, with ample photographic illustration of the uses of the process, has just been published by the Imperial Smelting Corporation, Ltd.

Four-Head Pneu-Rotary Capper

For purposes of demonstration Pneumatic Scale Corporation, Ltd., have recently installed one of their Four-head Rotary Capping machines on the premises of British Duplex Seals, Ltd., of Piccadilly, London. By arrangement all those interested will be afforded the opportunity of seeing this machine in operation at any time.

New Ice Factory and Canning Enterprise

May 24 marked the opening of a new large modern ice factory and cold stores, situated on the river Tyne. Erected by the Tynemouth Corporation, the building comprises three floors, two of which are given over to administrative purposes.

Accommodation has been provided for the storage of ice, meat and other products, and supplies can be taken from these cold chambers and loaded direct on to ships at the quay or lorries in the loading dock on the quayside.

Tyne Brand Products have transferred their clerical department to the new building, from their premises on Brewhouse Bank, and have thereby made room for further extensions to their canning works and the employment of more people in those works, in addition to which the old ice factory buildings on Brewhouse Bank are at present being converted into additional canning factories.

New Vegetable Gum

A leaflet just issued by Manucol Products, Ltd., describes Manucol Gum, which is said to be quite stable and capable of indefinite storage. It is an entirely harmless and edible vegetable carbohydrate, and conforms in all respects with the requirements of the Food and Drugs Act. The manufacturers claim that weight for weight it has greater thickening power than any other colloid or vegetable gum, and will absorb more water even than gum tragacanth to form a mucilage of similar appearance and properties.

Thimble Tube Boilers

We have received a copy of a paper read at the spring meetings of the Institution of Naval Architects by Mr. E. F. Spanner on the subject of thimble tube boilers. The paper is the result of much careful work and experimenting, and is a valuable contribution to current engineering knowledge.

Noise

A very well-produced book is issued by Newalls Insulation Co. on the subject of noise absorption and insulation. Methods of insulation are described and illustrated. Such installations reduce noise, for example, in a factory by cutting out reflection of sound; suitable fitments can damp the noise and vibration of heavy machinery and prevent it affecting a whole building. Boardrooms and offices under the same roof as a factory can be quietened considerably by expert treatment.

"Speaking of Wire"

This is the title of a booklet from British Ropes, Ltd., section A of their catalogue. A very thorough classification of over thirty kinds of wire, some notes on its production and uses.

Publicity Films

We have received from Sound Services, Ltd., a booklet giving an outline of programmes at present being distributed. A number of the films deal with foodstuffs, and films have already been made for the Millers' Mutual Association, Alfred Bird and Sons, British Commercial Gas Association, The Gas Light and Coke Co., Imperial Chemical Industries, Australian Trade Publicity, etc.

Other Trade Literature

Folder No. 56 from the Cambridge Instrument Co., Ltd., on the subject of *p*H recording and control.

An eight-page leaflet describing the laboratory and smaller industrial stills of the F. J. Stokes Machine Co.

A booklet from the Dressing and Screening Co., Ltd., illustrating metal conveyor belts, and another on the subject of indestructible "Gumco" screens (no corrosion).

Also their general catalogue of dressing and screening apparatus for all purposes.

FOOD INDUSTRY IN GERMANY

Food Group sees Milling and Baking, Dairying and Margarine Making, and Coffee Improving Establishments

LEAVING LONDON on April 29, members of the Food Group of the Society of Chemical Industry paid another visit to the Continent, this year to Germany, where they spent a very enjoyable and instructive week in and around Hamburg. Recreation and sight-seeing were well mixed with visits to factories, which were this year fewer in number though none the less interesting. Everyone appears to be agreed that though last year's trip was accounted most successful and enjoyable, this trip equalled if not surpassed it. During the whole of the time the party stayed at one hotel and the hours of the visits were much less strenuous. Also by having each meal at a different place many picturesque old restaurants were seen and the life of the people much more closely appreciated.

The visitors were received at Hamburg by members of the Verein Deutscher Chemicker and representatives of Fremdenverkehrsverein Hamburge V. May Day festivities provided one of the attractions, the greatest occasion of all being the visit of Herr Hitler to Hamburg to launch a new KdF boat, when Dr. E. F. Armstrong had the honour of sitting in one of the seats next to the Fuehrer during the ceremony.

Apart from a visit to the Municipal Farm outside Hamburg, all the factory visits were of particular interest to food manufacturers. A description of these visits by one of the members of the Group is given below.

A photograph taken during the recent visit of the Food Group of the Society of Chemical Industry to Germany, showing the party at the Carlshoh poultry farm. Left to right, front row: Messrs. F. J. Griffin, A. J. C. Cosbie, J. R. Nicholls, Mrs. D. A. Newlands, Mr. A. P. Buchanan, Dr. E. F. Armstrong (in dark hat), Dr. Esskuchen (Farmsen), Mrs. A. J. C. Cosbie, Dr. A. Green and Herr Eppinger (the guide). Mr. H. Heron is standing behind Mr. Cosbie and Dr. Franklin Kidd and Mr. and Mrs. C. A. Bassett behind Dr. Esskuchen and Mrs. Cosbie.

FACTORY VISITS

Plange Flour Mills, Hamburg

This very modern and well-operated flour mill is the largest in Europe, having a capacity of 800 to 850 tons of flour per 24 hours (against 600 tons for the largest English mill).

We were told that in 1936 all the wheat treated in the mill was German grown. In the first 6 months of this year the mill was working on 75 per cent. German + 25 per cent. imported wheat; at the end of the year this figure will be reduced to 40 per cent. German. The mill employs 300 workmen and their concrete wheat silos have a capacity of 12,500 tons.

Whereas English mills, as a rule, are working the "4 break system" this mill works on the "5 break system", obtaining a total of 75 per cent. extraction + 25 per cent. germs and offals, the flour being classified as a "first-class flour" consisting of 53 per cent. "top" and a "second-class flour" consisting of the remainder—47 per cent. "bottom". The plant can be used for the milling of rye, except in the case of wholemeal rye flour with 100 per cent extraction—when stones are used.

In the large and well-equipped laboratories, routine tests for moisture, ash, sugar, and gluten are carried out. It is interesting to note that here, as usual in Germany, ash determinations are done at 900° C., whereas 600° is standardised in this country.

A special laboratory is utilised for routine baking tests.

Julius Busch Bakery, Hamburg

When walking through the numerous buildings of Julius Busch's bakery in Hamburg one gets a clear impression of the growth of this concern. Julius Busch founded it in 1889 and is still sole owner. In spite of war and after-war crises, it has now developed into an imposing business with its own flour mills able to grind 100 tons cereals per day and employing over 1,000 people. Its produce is distributed through 80 branch shops and over 200 independent shops. Although most of us were acquainted with bakeries and biscuit factories of larger dimensions housed in more roomy and modern buildings, it was very interesting to study the imposing number of varieties produced in one bakery. Many types of bread and pastry, quite unknown to English bakers, are made, for instance, the black rye bread baked from unmilled rye with sour dough and an oven time of 14 to 15 hours. A variety of this rye bread baked for 6 hours is wrapped in tinfoil for export to England. The types

most popular in Hamburg pass through a gas flame to give them their special flavour.

In the white bread department, we were shown the seven units consisting of weighing, moulding, and baking ovens (partly electrically heated), each unit dealing with 10,000 rolls per hour, thus producing an average morning's output of 70,000 rolls. Another example of the latest developments in oven technique is the electrically heated ovens, 72 feet long, each baking continuously 900 3-lb. loaves per hour on stone plates.

When finally mentioning that this bakery also produces biscuits, numerous types of pastry, and macaroni, it will be understood that the visit was all too short.

Hansa Dairy, Lübeck. *(Hansa Mierei A.G.m.b.H.)*

In this modern dairy situated in Lübeck, the director, Dr. Voss, gave an interesting review of its history. He described the hopeless conditions for milk producers before the Lübeck Milk Marketing Scheme was effected at the beginning of 1935, and the improvements in prices obtained by farmers since the marketing scheme was introduced and the Hansa Dairy built. It is now owned by a co-operative society, including all farmers supplying milk to Lübeck (800 farms with 8,000 cows), and is dealing with 23 million kg. out of the total of 28 million kg. supplied to Lübeck. It is furthermore responsible for settling accounts with all Lübeck suppliers and for the control and testing of the total milk supply of the town.

In addition to supplying fresh milk, the dairy produces condensed milk, milk preparations such as cocoa-milk in bottles, cream in aluminium tubes, Kefir milk, Yoghurt milk, and cream cheese.

We were shown over the factory by Dr. Oldenburg, and the plant for producing the so-called "coffee cream"—a 10 per cent. cream sold in aluminium tubes—was studied with great interest. From the weighing machines the cream passes over homogenisers (200 atms.) and coolers to the glass-lined storage tanks, from thence to the filling machines, which automatically measure 55 gm. of cream into each aluminium cylinder. The open end of the cylinder is then flattened and folded over for sealing and finally the tubes are sterilised for ½ hour at 110° C. This plant is capable of filling 100,000 tubes per day. These are sold to retailers all over the country, who label and sell the cream at 10 pfennig per tube.

The very modern plant for pasteurising of fresh milk and the plant for evaporating 70,000 litres of milk per day to condensed milk (25 per cent. dry matter) are of the very latest design. In the laboratories for routine testing and analysis of all stages, our dairy experts were very interested in the latest type of apparatus for filling 18 butyrometers simultaneously by one turn of a handle.

A. L. Mohr's Margarine Factory at Bahrnfeld, Hamburg

This factory was founded by A. L. Mohr, but is now a link in the great Unilever concern. The director, Dr. Wassmann, gave a very instructive summary of the margarine industry since Mège Mouriès first produced a butter substitute from beef fat—a development that has culminated in the use of hydrogenated oils—for instance, from whale oil. We were informed that this factory, with a capacity of 2,500 tons of margarine per week, is the largest of its kind in the world.

The walk round the factory under the guidance of the manager, Dr. Wegelin, and the chief chemist, Dr. Becker, gave us an impression of a clean and up-to-date factory, where most of the ceilings and walls were covered with porcelain tiles. Most of the plant, including souring vessels for the skimmed milk, churns, coolers, and mixing plant are in one large room to achieve airiness and easy supervision. The main raw materials used at present are hydrogenated whale oil (about 40 per cent.), copra, soya bean oil, and skimmed milk. It was of special interest to notice 2-inch pipe lines for milk, made up in 10 feet lengths of Jena glass assembled with metal couplings—the object being to eliminate the taste arising from metal tubing.

It was also noticeable that the usual addition of 10 per cent. "Sesamoil" (compulsory for food inspection) had been substituted by a 2 per cent. potato starch.

All margarine produced in this factory is for inland consumption.

Coffee Improvement Factory at Wandsbek, Hamburg

In this factory the coffee berries are extracted with the object of removing, as far as possible, the caffeine. The extracted coffee is supplied to the coffee trade and sold under various trade names at a cost which is about 20 per cent. higher than untreated coffee. The crude alkaloid (caffeine) is sold as a by-product.

Each of the two extractors holds 1½ tons of berries, and ethyl acetate is used as a solvent. By this extraction—in 10 to 15 hours at 70° C.—the caffeine content in the berry is reduced from 1·3 per cent. to about 0·08 per cent.

After extraction is complete, traces of solvents are removed by means of hot air. The berries are subsequently polished.

E. O.

FREEZING POINT OF MILK

A New Apparatus for the more Rapid and Economical Determination of the Freezing Point of Milk. By P. L. Temple.

At a meeting of the Society of Public Analysts on May 5 the author described a new apparatus, the essential principle of which is that the measurement takes place in a bath of calcium chloride solution freezing at −2·3° C. This temperature is continuously maintained by circulated brine thermostatically controlled at −5° C. The results obtained with this apparatus agree closely with those given by the Hortvet apparatus, and many of the drawbacks of the latter are eliminated.

Flavours in Foods and Food Products

Abstracts of a symposium of papers presented before a meeting of the Division of Agricultural and Food Chemistry of the American Chemical Society, at Chapel Hill, North Carolina, U.S.A., April 12-15

Measuring food flavours. Ernest C. Crocker, A.D.Little, Inc., Cambridge, Massachusetts

Consideration is given to the quantitative estimation of each of the individual components of flavour, and of total flavour. It is noted that in direct comparison, by taste, one can usually detect strength differences of 10 per cent., and trained tasters can do even better.

This paper includes a review of commercial methods of flavour evaluation, comparing the methods of chemists, professional tasters, chefs, and flavour technicians, in a wide variety of industries.

It is observed that many professional tasters have no keener sensibilities than other people, and that sensitivity is not increased through practice, but there is developed the ability to observe, analyse, and interpret the sensations received to a valuable degree.

The application of laboratory methods to commercial flavour control is discussed.

Obtaining a panel for judging flavours in food. Florence B. King, Bureau of Home Economics, U.S. Department of Agriculture

In order to obtain a panel for judging flavours in bread sixty-four individuals were tested for their acuity of senses of taste and smell. To test sensitivity of taste they evaluated their sensations and identified in duplicate solutions of chemically pure sodium chloride, sucrose, lactic acid, and caffeine, when tasted in order of increasing strength. To test acuity of sense of smell they identified by odour eight familiar substances. Elimination of individuals who lacked consistence in taste sense and acuity of smell sense reduced the group to twenty-five. This group was tested further to establish its discriminatory powers by rating in duplicate bread samples containing different quantities of sodium chloride, sucrose, lactic acid, and caffeine respectively. Elimination of the indiscriminating by this test reduced the final panel to fourteen members.

Analyses of the data on the identification of the chemically pure solutions showed no cases of taste blindness for any one of the four substances. There was a significant relationship between threshold of taste for acid and the use of tobacco and the age and sex of the individuals. The threshold for smokers, females, and persons under thirty years of age was significantly lower.

Some fundamental assumptions pertaining to the judgment of food flavours. Washington Platt, The Borden Company, 600, N. Franklin Street, Syracuse, New York

Attempts to determine human preferences for foods often yield disappointing and even unreliable results. One cause for this is a failure to understand clearly the fundamental assumptions involved in the determination. Each of these assumptions introduces a certain error. By recognising these errors steps can be taken to minimise them, or at least to allow for them in estimating the reliability of the result.

Consumer judgments between two food samples vary greatly in the complexity of the problem.

In the more complex problems some of the assumptions are: (1) The judges selected are fairly representative of the whole population concerned. (2) The preference expressed in the test is the same as would be found if the same foods were eaten under normal conditions. (3) The reaction of the same judge to exactly the same food will continue to be the same throughout the period of the test. (4) The difference between the two samples is greater than the difference between successive lots of the same sample. (5) Preferences expressed represent reliable, reproducible decisions and are not mere guesses which may easily be reversed on later trials.

Means are presented for minimising errors introduced by these assumptions. A new method is suggested for reporting results which takes account of the large number of non-reproducible guesses found in most tests of human food preferences.

Flavours of meat and meat products. Paul E. Howe and Nicholas G. Barbella, Bureau of Animal Industry, United States Department of Agriculture

There is little concrete evidence as to the chemical characteristics of meat flavour. The responsible constituents as ordinarily recognised appear to consist of a composite of salts, acids, and a group of products resulting from heating extractives, possibly disintegration products of proteins, and lipids. The quantity and quality of these products are related to the extent and duration of heating. There are certain inherent flavours in the fat of meat that are characteristic species which become evident when the fat is heated. Fats contribute body, richness, or smoothness to meat juices or gravies which, although chiefly mechanical in effect, have much to do with the desirability of the meat. Age of the animal also has an important influence on flavour of the meat, as baby beef in contrast to beef from more mature cattle and lamb in contrast to mutton.

Ripening of meat results in an increase in soluble protein products which, when heated, play an important part in the flavour of such meats. New flavours are developed by aging of cured meats characterised by the Southern ham. The new flavours are apparently disintegration products of protein and fat characterised by such terms as cheesy, pungent, and spicy.

Oxidation in relation to off-flavours in milk and milk products. L. M. Thurston, Dairy Technologist and Professor in Dairy Manufactures, University of Florida

Tallowy flavour in butter and in dry milk is the result of oxidation of the butter fat present. The reactions are catalysed by copper, to a lesser extent by iron, and may be catalysed by silver, nickel, or lead. Isolation from oxidised butter fats of saturated aldehydes and acids suggests that the oxidation is a progressive formation and oxidation of unsaturated compounds.

Oxidised flavour in milk, also called cappy, papery, pulpy, metallic, oily, tallowy, oleaginous, emery, corundum, empyreumatic, and loamy-astringent flavour, usually is attended by a rise in oxidation-reduction potential until the flavour develops several hours after the milk has been processed and stored at low temperature. Some milks develop oxidised flavour spontaneously, others only after contamination with copper or iron, and others cannot be caused to develop this flavour. Pasturing the cows, feeding carrots, orange juice, lemon juice, tomato juice, or ascorbic acid reduces or eliminates the susceptibility of milk to oxidised flavour development. Such treatments as homogenisation, agitation at low temperature, freezing followed by thawing and heating to 85° C. for five minutes also reduces or eliminates susceptibility. Oxidised flavour may be the result of the oxidation of the butter fat or of the lecithin of the absorbed layers on the fat globules.

In ice-cream a so-called stale-metallic flavour appears to be the result of oxidation. This flavour occurs to the greatest extent in strawberry ice-cream and is favoured by the presence

of copper as a contaminant and the action of some constituent of the strawberries. The addition of copper to an ice-cream containing strawberries causes a rise in the oxidation-reduction potential. The off-flavour does not occur when contamination of the mix with copper is avoided.

Modern trend in flavours. Bernard H. Smith, Virginia Dare Extract Company, Inc., Brooklyn, New York

Monotony in diet gravely upsets digestive processes; hence the necessity for variety in flavour. There is a distinct trend to-day towards the production of blended or harmonised flavours. The art of blending supplies a dominant note or illusive background which assists in producing a product of superior excellence.

With flavours in which essential oils are used, attention is being paid to the better keeping of the products after the package is opened or in use by means of the elimination of air or the use of anti-oxidants.

The use of spice oils, resins, and blended spices is developing for use in place of the whole or ground spice. Among bulk users there is a tendency toward more concentrated flavours for the purpose of economising in solvent and delivery costs.

Quality in flavour is being emphasised more than ever before and the consumer is becoming more flavour conscious.

The chemical determination of flavour in butter and butter cultures. M. E. Parker, Chairman, Research Committee, American Assn. Creamery Butter Manufacturers, Chicago, Illinois, G. W. Shadwick, Jr., Director of Control Laboratory, Beatrice Creamery Co., Chicago, Illinois

Because it is a staple food, uniformity is quite as important as the excellence or delicacy of flavour in butter.

The historical development of our present concepts of controlling the flavour-producing factors in butter-making records primarily the chemical changes involved in the ripening, or souring, of cultures of selected micro-organisms in milk so as to produce the desired flavours to be occluded in variable but decreased amounts in the butter mass upon completion of the churning process.

Butter cannot be effectively standardised in flavour content by remote control of these flavour-producing micro-organisms in a butter culture. Consequently, the discovery of a method of utilising the essential flavour constituents of a satisfactory butter culture in the form of a condensate recovered by steam distillation for direct incorporation into butter promises to establish an important milestone in the chemical control of flavour in this important food product.

Utilisation of cerelose (dextrose) in canned and preserved foods. C. R. Fellers, Massachusetts State College

Refined corn sugar (dextrose) sales totalled 240,000 lb. in 1936. This huge amount is absorbed largely by the food industries. The free use of dextrose in foods without label declaration was authorised in 1930 by the Secretary of Agriculture. Cerelose contains one molecule of water of crystallisation, giving an average purity of 91·4 per cent. with an ash content of only 0·05 per cent.

Extensive experimental packs of canned fruits and vegetables, fruit products and pickles, where cerelose has been substituted in part for sucrose, show many products are improved in quality by the use of cerelose. In general, optimal quantities vary from 20 to 50 per cent. of the total sugar present. Cerelose cannot be used in concentrations above 50 per cent. because of crystallisation. Products which were improved by the use of 20 to 40 per cent. of cerelose were canned prunes and plums, rhubarb and apple sauces, tomato juice, sweet pickles, sweet and sour cherries (excluding black, sweet varieties), apricots and some varieties of peaches. Packs in which cerelose could be substituted in part for sucrose without affecting the quality of the product were peas, beets, apple butter, strawberry and pineapple preserves, citrus marmalade, cranberry sauce, currant, apple and quince jellies.

The addition of 1 per cent. cerelose to cucumber pickle brines accelerated fermentation, produced a higher final acidity, and aided in maintaining an active flora of lacto-bacilli.

The use of activated carbon for correction of flavours. John W. Hassler, Industrial Chemical Sales Division, West Virginia Pulp and Paper Company, Tyrone, Penna

Activated carbon when suspended in a liquid provides a large interfacial surface. Taste and odour bodies are frequently capillary active and move to any surface or interface such as a liquid and carbon boundary and become concentrated there. They then become attached by the free valences of the activated carbon.

Taste removal by activated carbon is limited to products which can be reduced to a liquid form, and where the taste is caused by the presence of foreign bodies.

Activated carbon can be used for complete removal of taste and has a wide commercial application at the present time for this purpose. In many cases it can be used for the selective removal of certain undesirable flavours.

A description of the commercial application of activated carbon for the removal of undesirable flavours from gelatin and oils is given.

APPLICATION of ETHYLENE OXIDE in BARGES CONTAINING DRIED FRUIT

THE fumigation of dried fruit on arrival is conveniently carried out in the steel barges used to transport it from ship to warehouse. The capacity of most of these barges lies between 5,000 and 7,500 cu. ft. Most boxes of fruit contain 56 lb., and are placed on edge in single tiers, of which there are normally 20 to 24, 6 or 7 boxes high.

The fumigant used is ethylene oxide containing 10 per cent. of carbon dioxide, and is supplied in cylinders of 60 to 80 lb. capacity. At temperatures above 50° F. the fumigant is sprayed directly into the barge. Below this temperature it is advisable to use a vaporiser, and W. Burns Brown, in a paper in the *J.S.C.I.*, April, 1937, 116T., gives details of suitable sprays and vaporisers, and describes experiments with the concentrations, in the barge, of the ethylene oxide.

The dose of fumigant is calculated on a basis of 1 lb. for every 50 boxes of fruit (approximately 1¼ tons) and 6·5 lb. per 1,000 cu. ft. of free space, it being assumed that the fumigant contains 85 per cent. of ethylene oxide. For correct dosage it is necessary to know the purity of the fumigant; fumigation usually lasts for 18 hours. Experiments have been carried out to determine the toxicity of all stages of *Ephestia elutella*, *E. cautella*, and *Plodia interpunctella* to ethylene oxide, and it has been concluded that the minimum concentration in the free space in a barge, fifteen minutes after the end of vaporisation, to give reasonable certainty of complete kill, is 60 mg. per litre.

Experiments trying the permeability of tarpaulin to ethylene oxide show that with new tarpaulin the fall in concentration in 3·5 hours was 3·5 per cent., and with worn tarpaulin, 7 per cent. Since, in practice, hatch covers are sheeted down with a double layer of tarpaulin, the loss of fumigant by diffusion is not considered significant.

INDIAN SCIENCE CONGRESS

Abstracts of some interesting papers read in the Sectional Meetings of the Indian Science Congress at Hyderabad (Deccan) in January (1937)

(From our Special Correspondent)

The distribution of ascorbic acid oxidase in plant and animal tissues. By B. C. Guha, Calcutta

In general the animal tissues investigated—including the liver and kidney tissues of the cow, guinea-pig, rabbit, fish, and fowl—appear to contain practically no ascorbic acid oxidase. Among the vegetable foodstuffs studied, cucumber appears to be the richest source of the enzyme, while many common Indian fruits, like pineapple, mango, guava, are practically free from it.

Plant phosphatases. By K. V. Giri, Bangalore

A highly active preparation of phosphates from sprouted soya bean has been obtained by purification of the crude aqueous extracts of the germinated seed powder. The method consists of (*a*) fractional precipitation with alcohol or acetone, (*b*) solution of the most highly active fraction, (*c*) precipitation of the impurities at *p*H 5·0, and (*d*) final dialysis or filtration. The strength of the preparation was about 102 Ph.P.E./mg. for glycerophosphate hydrolysis and about 210 for pyrophosphate hydrolysis. The preparation is about 350 times as active as the original sprouted seed powder. It gives protein and carbohydrate reactions. The behaviour of the purified enzyme under different conditions of temperature, *p*H, its specificity towards various phosphoric esters and its activity in presence of various salts has been studied in detail. The relation between the activity of the phosphatase and vitamin C in association with metals like copper has also been studied.

From a study of a number of plant materials and animal tissues it has been found that the ratio

pyrophosphate P : glycerophosphate P

is greater than 1 in the case of plant extracts and less than 1 in the case of animal tissues, when the enzyme is allowed to act on the respective substrates and the inorganic P liberated is determined. This difference in the properties of the phosphatase systems of plants and animal tissues may be applied to cases where the origin of the phosphatase has to be determined.

Absorption and excretion of tin in rats fed with food prepared in tinned vessels. By N. C. Datta, Bombay

Experiments were carried to study the growth of the animals and also to follow the path and the rate of excretion of tin in the fæces and urine of rats fed with food prepared in tinned brass vessels. The results indicate that :

(1) The growth was about 10 to 15 per cent. lower than control animals during a period of 3 to 4 months. The animals, however, appeared healthy in other respects and no serious poisoning effect was observed in any case.

(2) About 80 to 90 per cent. of ingested tin was found in the fæces during the period of feeding. A part of it, however, was retained in the body for some time and was only slowly excreted. Most of the tin retained was found in the intestine and colon. The quantity in the urine was very small, showing poor absorption of the metal.

(3) Accumulation of the tin in the liver was very small. The concentration of the metal in the kidney was much higher than in the liver. It is possible that during the course of its excretion in the urine it was stored in the kidney. Histological examination of liver and kidney did not show any injury to the cell structure.

Extraction and chemical analysis of the proteins of green gram and lentil. By K. P. Basu, Dacca

Green gram (*Phaseolus Mungo*) and lentil (*Lens esculenta*) have almost the same percentage composition, the protein contents being 23·2 per cent. and 22·6 per cent. respectively. In both cases 92·3 per cent. of the total nitrogen can be extracted by solvents. As many as seven different proteins have been isolated from green gram, but only three from lentil. The water soluble protein of lentil could not, however, be obtained in a pure condition. Proteins in lentil are markedly deficient in cystine, which might account for the lower biological values obtained with this pulse, and also might easily explain the loss of fur in animals observed in the long period feeding experiments. Lentil contains a smaller percentage of histidine (an essential amino acid) than the green gram; but both arginine and lysine contents of lentil are higher than those of green gram. Autohydrolysis of proteins in lentil is less than that in green gram, and is therefore not the cause of the presence of such a large amount of non-protein nitrogen in the former.

Detection of adulteration of cereal flours by the "agar plate" method. By K. V. Giri, Bangalore

The method (*Science*, 1935, **81**, 343) previously developed for the differentiation of pure starches has been extended for the differentiation of cereal flours and their detection, when present in mixtures. The cereal flours have been classified into groups according to their characteristic coloured diffusion zones developed when a drop of amylase solution has been allowed to diffuse through an agar plate impregnated with the boiled extract of the flour and finally flooded with iodine. The method has been successfully applied to the detection of rice flour in wheat flour. It has been found possible to judge easily to the nearest 20 per cent. of rice in a given mixture. The method has also been applied to the detection of adulteration of rice with maize, barley with wheat, *jowar* with rice, etc. The method is particularly useful when the material is cooked, in which case there is no method available for the detection of adulteration.

THE IODINE CONTENT of TEA

LEAVES from some 10 brands of tea were supplied by the Tea Experiment Station, Kyoto, and were submitted to analysis for their iodine content by the authors—Itano and Tuyi, *Ber. Ohara. Inst.*, 1936, **7**. Hot water extracts from leaves of the same teas were also analysed. All contained iodine, the amounts varying from 0·45 to 1·20γ per gr. of dried leaves ($\gamma = \frac{1}{1000}$ mg.), the larger amounts being found in the younger leaves. From 33 per cent. to 75 per cent. of the original iodine present was extracted when the leaves were powdered and boiled with hot water for 30 minutes.

VITAMINS IN CANNED MILK

OWING to a typographical error in the article which appeared last month under this title, *ascorbic acid* was incorrectly referred to as *ascorbutic acid*.

NEW BOOKS

Chemical Industries, 1937

An annual compilation of this nature serves many purposes, not the least being that comparison can be made from year to year of the progress attained in the various industries. That this is possible indicates that *Chemical Industries* has been thoroughly revised each year, and this, the eleventh edition, provides much that is new in both subject matter and format.

The same order has been observed in the arrangement of the ten sections, an important point, since it is unnecessary to re-learn the order of the book. A great improvement is the provision of a cut "thumb" index to the sections, and the addition of an index to the technical data renders the obtaining of information even more simple. The sections, in the following order, deal with Materials of Construction, Power Plant, Chemical Plant, Size Reduction, Separating, Handling, Instruments, Heavy Chemicals, Fine Chemicals, and useful tables. An extensive and up-to-date Bibliography rounds off the volume.

Additions to the subject matter include a chapter, in Section 5, on Centrifugal Separation, wherein is described the application of this method to the dehydration of oils, cream separation, the clarification of viscous liquids, etc. Section 9 has been considerably expanded to introduce seven pages devoted to an entirely new Table of Physical Constants of Drugs and Pharmaceutical Chemicals, which table will be of the greatest assistance to soap and cosmetic makers, pharmacists and manufacturing chemists generally, and brings the data regarding Fine Chemicals and Drugs into line with the information of the preceding section (8, Heavy Chemicals), on the Physical Constants of the Elements, Inorganic and Organic Compounds.

Of considerable interest to perfumers and soap makers, etc., is the revised Dictionary of Materials for Perfumery to be found in this section, which contains new data and includes information concerning many new products, oils and resins, etc.

Carefully selected advertisements, grouped at the end of each section, provide ample illustrations pertinent to the subjects. *Chemical Industries*, 1937, will find a ready place in every library and laboratory, and the editor is again to be congratulated on the production of a book the utility of which steadily increases.

J. P. L.

Chemical Industries, 1937. *11th Edition. Pp.* 374 *and lxxix. Leonard Hill Limited, London.* 10s.

Strontium Minerals and Food Processing

Although strontium is widely distributed throughout the world, only occasionally is it concentrated sufficiently to form deposits of economic importance, which deposits consist essentially of celestite ($SrSO_4$) and strontianite ($SrCO_3$). The former is found near Bristol, and the latter in Westphalia, Germany.

Compounds of strontium are used largely in the beet sugar industry for the desaccharification of molasses, which contain about 50 per cent. of sugar not readily crystallisable. Part of this sugar can be recovered by the "Scheibler" or "Strontia" process, which consists briefly in heating the molasses to about 100° C. with a solution of strontium hydroxide to form a precipitate of strontium disaccharate, which, on separation and suspension in water, is next decomposed by means of CO_2 into a solution of sugar and a precipitate of $SrCO_3$. The sugar is recovered normally, the $SrCO_3$ being filtered off and regenerated into strontium hydroxide by calcination and solution in water. It is stated that good results are obtained if, for every ½ kg. of strontium hydroxide, 1 kg. of molasses and 1½ kg. of boiling water are used.

The book is well texted, and is a most comprehensive treatise on the production, utilisation, and occurrence of these minerals.

Strontium Minerals. By E. H. Beard, B.Sc. 2nd Edition. Pp. 33. *Imperial Institute, London.* 1s. 6d.

CORRESPONDENCE

Blaming Canned Foods

From Professor F. W. Tanner, Head of the Department of Bacteriology, University of Illinois, U.S.A.

Your editorial on page 109 of the April issue of FOOD MANUFACTURE entitled, "The Canning Industry and Food Poisoning Cases," is quite appropriate. Search of the literature of food poisoning reveals many reported cases and outbreaks which rest on faulty logic, careless observations, and lack of any appreciation whatsoever of the technical problems involved in packing and examining canned foods. Practitioners of medicine are too prone to attempt to qualify as experts in fields in which their training, and perhaps experience, would indicate little competence.

Many reports of food poisoning outbreaks attributed to canned foods say nothing about how the food was handled after the can was opened. Home-makers or other individuals who use canned foods have much responsibility in seeing that the canned food is carefully handled after removal from the container. Many sound and high-quality preserved foods have been maligned and stigmatised by changes induced by improper handling. This is a point which is overlooked by many of those who are determining the origin of food poisoning outbreaks.

I am writing you because only this past week a similar situation was presented to me. A very fine product which has been absolutely free from suspicion was suggested as the cause of a food poisoning in Europe. There is plenty of evidence that the material was not properly handled. A year or so ago I had the opportunity of investigating a food poisoning outbreak attributed to one of the finest products which is packed in the United States. This product has never caused trouble. However, the food was taken from the can, mixed in an unclean utensil, and infected with a food poisoning organism. The outbreak was characterised first as a canned —— outbreak of food poisoning. It should have been characterised as a food poisoning caused by careless handling of canned —— in a dirty utensil. I should think that canners in England would unite not only to fight these situations in self-defence but to educate both practitioners of medicine and the general public.

F. W. TANNER.

KAOLIN in FOOD POISONING

DISCUSSING medicinal kaolin in food poisoning, N. Evers, in a letter to the *British Medical Journal*, points out the wide use of the methylene-blue test as a means of comparing the adsorptive powers of different specimens of kaolin, and mentions that on physico-chemical grounds the method is to use an excess of methylene-blue and, after a given time, calculate the amount adsorbed. The *p*H should be adjusted to a standard value.

INFORMATION and ADVICE

Tomato Sauce—Custard Powder—Canning Cocktail Frankfurts—Lemonade Crystals—Canning and Jam Making—Strawberry Pulp—Raspberry Vinegar —Coffee Essence

Tomato Sauce

2,123. *Can you give us information as to the manufacture of a cheap tomato sauce, please?* (Newcastle-upon-Tyne.)

A typical formula for tomato sauce with which you can experiment is the following:

Tomato purée	25	gal.
Pale malt vinegar (16 grain) ..	8	,,
Table salt	7	lb.
Gum tragacanth	1	,,
White sugar	25	,,
White pepper	8	oz.
Ground ginger	8	,,
Ground nutmeg	4	,,
Cayenne	1	,,
Raw onions	4	lb.
Garlic	½	,,

Place the gum in 1 gal. of the vinegar to soak for 24 hours. Add 1 gal. more of the vinegar to the gum, stir well. Peel the onions and chop fine. Place balance of vinegar in a steam pan, add sugar, salt, pepper, ginger, nutmeg, cayenne, onions, and garlic, also the gum. Stir well, add the tomato purée, bring to the boil, stirring all the time, and gently simmer for 20 minutes. Shut off steam and rub all through a fine sieve. Fill and cap.

This should be sterilised on a water bath, the temperature being brought to 195° F. in 1 hour, remaining at this temperature for 15 min. Run off the water and stand until cold.

Custard Powder

2,124. *Can you give us information as to how to make a cheap custard powder for re-sale in packet form?* (Birmingham.)

Custard powder is made from cornflour, arrowroot, sago flour or rice flour, or mixtures of these. Probably cornflour is the best because of its ready jellying power. We would either recommend a mixture of 60 lb. cornflour and 40 lb. arrowroot or 120 lb. of cornflour to which 10 to 30 lb. icing sugar may be added if a sweet powder is desired. For white powders add 4 oz. almond essence. For yellow powders mix in 4 oz. saffron and flavour with lemon.

Mixing may be done in three ways. Grind dry colour with a portion of the flour and mix with the rest of the batch. Spray the colour into the flour in a mixer. Mix colour solution with part of batch, then dry, grind and mix. Mix this base with the rest of the batch in two or three stages. Or, according to another method, spread the cornflour on a table, sprinkle over it the colour and the flavour and mix well. Then fill into open bags (paper) containing about 25 lb. each. Stack on shelves in dry room for several days and allow to dry at 110° to 115° F. Strip off paper bags and spread lumps on wooden trays to a depth of about 3 in. and dry in room for a week at 110° to 115° F. Then pass through steel rolls and fine sieve.

Canning Cocktail Frankfurts

2,125. *We would be greatly obliged for some information on the following subject: "We are canning small Cocktail Frankfurts or Frankettes about 1 in. long, in tomato sauce for 225° heat 40 minutes, but this heat overcooks and spoils; can you tell me how much lower temperature we can go and what time, without the pack blowing?"* (Australia.)

The indication of the time and temperature for the sterilisation of any product is impossible to give, as so much depends on composition, size of pack, etc. Anyone venturing to give precise figures for a pack, unless they have carried out the necessary trials on that particular pack, is simply guessing. You do not mention in what size tins or glasses you are packing your product. We would suggest that you reduce your sterilisation temperature to 212° F. (boiling water) and treat the pack for 1 hour. If the product is satisfactory under this treatment it remains to see whether it is sterile. You should keep at least a dozen containers in an incubator for 14 days at about 100° F. (or keep them in a warm place which would ensure them being at this temperature). Should there be no blown packs, you should consider the treatment safe, although it is advisable to repeat it once or twice. It would be an advantage if you could have a salt content between 4 and 5 per cent. of the total weight of pack. If blown packs manifest themselves, you should increase the time. Another alternative would be to retain the temperature of 225° F., and reduce the time, *applying the same tests to sample lots.* Low temperature sterilisation of products which are apt to be damaged in the sterilisation operation is preferable.

Lemonade Crystals

2,126. *Will you kindly let us have a formula for the manufacture of lemonade crystals? In colouring do you recommend the whole of the mix to be coloured or only a part, which is then mixed with the whole? If the latter, what percentage do you suggest? Is it usual to add the flavouring material to the liquid colour and to spray in together?* (Reading.)

Following is the composition of a lemonade crystal product:

Castor sugar	..	..	..	56 lb.
Citric acid ..	..	..	..	2½ ,,
Oil of lemon	..	..	..	8 oz.

5 per cent. solution of tartrazine in water.

Rub the colour and lemon oil into a few pounds of the sugar and thoroughly mix with the remainder of the sugar and citric acid. The whole should then be rubbed through a coarse sieve to break up the lumps and disperse the colour and flavour throughout the mass. To avoid the mass becoming sticky it is advisable to let it stand in the open room for a few hours—overnight for preference—before packing. A freer-running product is said to be obtained if 15 to 25 per cent. of the sugar is replaced with cerelose.

Canning and Jam Making

2,127. *Could you please advise me about the literature available on canning, and especially the making of strawberry and tomato products?* (Egypt.)

The 1937 issue of the *Food Industries Manual*, which has been fully revised, especially in the Canning and Confectionery (Jam Making) Section, will give you extensive information on canning and jam making.

In FOOD MANUFACTURE, May, 1936, T. N. Morris, M.A., described the preservation of fruits for out-of-season jam making by chemical preservation and by freezing. This should be helpful to you. The production of fresh fruit juices for which the strawberry is used was described by V. L. S. Charley, B.Sc., in FOOD MANUFACTURE, May, 1936, page 173.

Regarding tomato products, the manufacture of tomato purée and pulp was the subject of a special April number of FOOD MANUFACTURE this year.

Strawberry Pulp

2,128. *Would it be permissible to mix a small proportion of lime with strawberry pulp, as well as sulphur dioxide, in order to exert a hardening effect to keep the fruit whole?* (London.)

We know of no reason why you should not mix lime with strawberry pulp. By far the most satisfactory method, however, would be to use calcium bisulphite solution, which is sold on a large scale for the preservation of fruits. The solution contains 6 to 7 per cent. SO_2, and Morris recommends that such a solution should be used at the rate of about 6 pints to a 40-gal. cask of fruit. It would appear that the hardening effect of the calcium salt on berry fruits is now authenticated.

Raspberry Vinegar

2,129. *Can you give us a formula for the manufacture of a raspberry vinegar based on a pure fruit raspberry essence?* (London.)

We do not know of any commercial method for the production of this product. The accepted method in the U.S.A. for producing vinegars from any of these fruits is to proceed along the lines of the manufacture of cider vinegar.

This involves the extraction of the juice from the fruit, the fermentation of the juice into a product with about 5 per cent. of alcohol by weight (the original gravity of the fruit juice must be adjusted to about 1·050 to provide sufficient sugar for the fermentation), and, finally, the conversion of the alcohol into acetic acid either by the slow process in cask or by running the fermented product through a vinegar tower, in which case one or two runs will give a high-grade vinegar with 4½ to 5 per cent. acetic acid content.

Excellent vinegars have been made on a small scale from raspberries and strawberries by this means, whilst cider vinegar is, of course, a considerable commodity in the States and Canada. There are indications that cider vinegar will shortly be produced in this country.

The well-known raspberry vinegar which is so frequently made on a domestic scale is produced by soaking fresh raspberries in an ordinary white vinegar for a period of several days and then raising the whole mass to the boil, after which, on cooling, the finished product is obtained by squeezing out the pulped mass. We should imagine that this is more expensive than using the other method, in which the vinegar is produced in the product itself.

Coffee Essence

2,130. *Will you please give us a recipe for the manufacture of coffee essence?* (Siam.)

The formula below will give a good basis for experimentation. It is difficult to give any advice as to what method should be followed, as, before one could recommend any particular type of process, it would be necessary to know the output that it is intended to produce, the amount of money that one is prepared to lay out on plant and equipment, the grade, flavour, consistency, etc., of the product, and, in fact, all particulars that bear on the question.

Coffee (a mixture of suitable grades, with or without chicory)				4 lb.
Water	..	..	..	10 gal.
Glycerin	..	..	..	3 lb.
White sugar	..	..	..	18 ,,
Glucose	..	..	..	18 ,,
Caramel	..	..	..	2½ ,,

Of course, a great deal depends on the choice of raw materials and in the blending of these, and also in the method of extraction employed.

Materials and Equipment Required

Enquiries have been received concerning suppliers of the following materials and equipment, and suitable recommendations have been made:

2,131. *German makers of food machinery.* (Southport.)

2,132. *Infant and invalid foods in bulk.* (Grantham.)

2,133. *Gaseous electric lamp.* (Birmingham and London.)

2,134. *Metal foil packing for biscuits.* (Lancashire.)

2,135. *Makers of Bolton and Williams colorimeter.* (Birmingham.)

2,136. *Composite containers.* (Finland.)

2,137. *Sterilising cabinet for bottled fruits.* (Wigan.)

2,138. *Emulsifier for mayonnaise.* (Sweden.)

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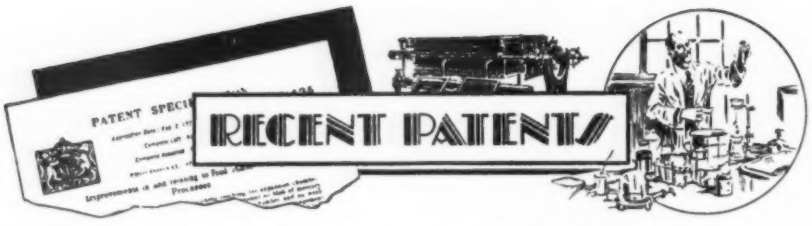

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Latest Patent Applications

9285. GREEN AND CO., LTD., H. J., GREEN, H. J.: Table jellies. April 1.
9346. IMPERIAL CHEMICAL INDUSTRIES, LTD.: Production of lecithin, etc.
9407. CHEMISCHE FORSCHUNGSGES.: Skins for sausages, etc. April 2. (April 8, 1936.) (Germany, April 11, 1935.)
9552. CLAYTON, W., MONTGOMERIE, J. A.: Preparation of dried protein products. April 5.
9583. NEWELL, Q. A. G.: Preparation for treatment of cow's milk. April 5.
9797. PEEBLES, D. D.: Manufacture of stable powdered products containing milk sugar. April 6. (United States, April 24, 1936.)
9837. FUSION-MOTEURS: Centrifuge for separating cream from milk. April 6.
9906. COOK, W. A. L.: Storage of eggs. April 7.
10056. HUZENLAUB, E. G., ROGERS, J. H.: Apparatus for treatment of rice. April 8.
10131. JONES, J. E.: Cold storage of food, etc. April 9.
10169. BIBBINS, F. E.: Manufacture of a stable liquid vitamin-containing preparation. April 9.
10344. KUNZLE, C.: Chocolate. April 12.
11037. BROWN, H. R., and STEEL, H. D.: Manufacture of macaroons. April 17.
10498. FORGROVE MACHINERY CO., LTD., HARRIS, R. A.: Apparatus for shaping, etc., plastic material, toffee, etc. April 13.

Complete Specifications Accepted

463,403. DOYLE, DR. J. D., and DOYLE, M. K.: Preservation of eggs.
463,425. BAKER, G. R., and BAKER PERKINS, LTD.: Rotary moulding machines for biscuit doughs and the like.
463,575. HALL, LTD., J. AND E., and GREEN, E. S.: Storage of fruit, vegetables, and the like.
463,698. CARPMAEL, A. (I.G. FARBENINDUSTRIE AKT.-GES.): Process for the manufacture of a vitamin preparation.
463,872. KERNOT, J. C.: Production of albuminoid or protein material.
464,021. SCOTT, R.: Edible jellies.
464,395. FAWCETT, E. W., WHITTAKER, D., and IMPERIAL CHEMICAL INDUSTRIES, LTD.: Production of oils rich in vitamins.
464,429. JACKSON, T. G., and MOLINS MACHINE CO., LTD.: Wrapping of block-shaped articles.
464,487. CHERRY-BURRELL, LTD., and CLARKE, F. J.: Apparatus for the manufacture of ice-cream bricks or blocks.
464,510. DIKANSKY, L.: Method and means for wrapping articles, more particularly fruit.
464,694. HECKERMANN, H.: Preservation of perishable articles and materials.
464,704. LORNIE, J. S.: Manner of withering tea-leaf and apparatus thereof.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 25s. each.

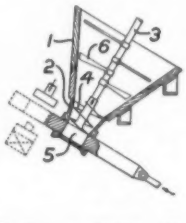
457,831. GROUP VI. **Food preparations; preserving blood.** MORRIS, S., 2, Waverley Gardens, Crossmyloof, Glasgow, and ACTON, W., 21, Greenock Road, Paisley. Dry animal protein substance is obtained from blood, egg contents, or aqueous extract of bones or hide by mixing therewith a solvent whereby the water is dissolved and the protein substance is precipitated, the precipitate being separated from the solvent and being treated either by a further application of the same solvent or by the use of another more volatile solvent which will dissolve the remaining mixture of water and first solvent, the solution being again removed from the precipitate, which is dried by exposure to air. In the manufacture of edible dried blood, the blood, after being drawn from an animal, is mixed with acetone or alcohol, which is afterwards drained off, the residue being mixed with diethyl ether. The mixture of ether and small traces of acetone or alcohol and water is drained off, and the sludge left is exposed to a current of air which vaporises the remaining solvent. In the preparation of dried blood albumen for use as a fixative in calico printing and as an adhesive, the blood is separated into serum and clot, and the serum is brought to an apparent *p*H value of 8 by addition of an alkaline substance, preferably trisodium phosphate. The serum is cooled to 0° C. and is mixed with cooled ethyl alcohol. The alcohol is run off and replaced by cooled ether, which is subsequently decanted, the residue being dried by a current of air. In a similar manner, when it is required to obtain egg albumen which is dispersable in water, the invention is modified by the addition of acid or alkaline substances to the protein substance and the first solvent, so that neither the liquid nor the sludge shall have the hydrogen ion concentration corresponding to the isoelectric point of the protein. In the manufacture of dry edible gelatine a solution of gelatine is delivered on to a rotating cooling drum A, on which it forms a gel. The gel is carried into a vat C of alcohol, which reduces the water content of the film so that it is easily detached by a doctor D. It is then carried over a guide pulley to a vat E containing diethyl ether, and afterwards passes through a tunnel F, where a draught of air removes the last traces of solvent.

458,581. **Improved shortening.** INDUSTRIAL PATENTS CORPORATION, Union Stock Yards, Chicago, Ill., U.S.A.
Rancidity is prevented or resisted by the mono- and/or di-acid glyceride prepared by reacting hydrogenated soya bean oil with an excess of glycerine. A creaming agent, for example, is prepared by heating a mixture of 100 parts hydrogenated soya bean oil with 30 parts glycerine at 288° C. until no more glycerine is absorbed (this point is indicated by refractive index measurements). In comparative stability tests a figure of 46 (active oxygen method of King, Roschen, and Irwin, *Oil and Soap*, June, 1933) was found for the above product as against 6 for a control lard and 15 for a blend of 95 per cent. prime steam lard and 5 per cent. hydrogenated soya bean oil monoglyceride. (Convention date, U.S.A., September 20, 1934.)

458,646. GROUP V. **Extruding pasty materials.** SCHILDE MASCHINENBAU AKT.-GES., B., Hersfeld, Hesse, Nassau, Germany.
Pasty material is formed into strings or noodles by being forced through holes *d* in a trough *a* by means of rotary vanes *b*. The vanes are mounted so as to revolve with a shaft *c*, and by gearing *h*, *l*, *n*, *e* they rotate on their own axes to press the material through the holes *d*.

458,847. **Food preparations.** HOFFMANN-LA ROCHE AND CO., AKT.-GES., F., 184, Grenzacherstrasse, Basle, Switzerland.
An ester of 2-ketolævogulonic acid is added to foods, including milk and canned tomatoes, to add vitamin C thereto. In examples, 0·5 gm. of the methyl ester is added to one litre of milk; 1 gm. of the ethyl ester is added to 1 kg. tomatoes, which are enclosed in cans and sterilised.

459,097. GROUP V. **Moulding butter.** BENZ, J., and HILGERS, W. (trading as Benz and Hilgers), 246, Münsterstrasse, Düsseldorf, Germany.
Butter is fed from a vertical or inclined hopper 1 to a reciprocating mould 5 by an intermittently rotated worm 4 in the lower part 2 of the hopper. Cutting and propelling blades 6 on the worm shaft 3 feed the butter to the worm.



The specification as open to inspection under Sect. 91 shows all the blades inclined. This subject-matter does not appear in the specification as accepted.

460,811. **Soya bean de-odorisation.** STALEY MANUFACTURING CO., A. E., Decatur, Illinois, U.S.A.
Soya beans are freed from the original disagreeable flavour and odour by heating to about 325° F. after soaking to bring the moisture content to above 20 per cent. of the dry weight. The beans are then dried at a much lower temperature to a moisture content of 4 to 6 per cent., ground to approximately 10 to 20 mesh per square inch, heated to about 200° to 220° F., and passed through an expeller to extract the oil content down to about 7 to 5 per cent. or less.

461,184. **Beverage from whey.** HIMMELSBACH, H., 55, Pall Mall, St. James's, S.W. 1.
A pleasant tasting and durable beverage is produced from whey which has been purified and subjected to "controlled fermentation"—*i.e.*, fermentation following addition of a fermenting agent and not that occurring spontaneously when whey is allowed to stand. The whey is first sterilised at 80° to 90° C., a treatment that also precipitates coagulatable protein. Unpleasant tasting substances are removed at the same time by addition of active carbon. After cooling to about 30° C. and standing to allow protein and carbon to settle, the whey is inoculated with yeast organisms and fermented in a closed vessel for 10 to 15 hours. Conditions under which fermentation is carried out will vary with individual batches of whey and the nature of the fermenting agent. In one case 2 c.c. of a culture in 40 gal. whey (acidity 0·5 to 0·6 per cent. as lactic acid) produced a final acidity of 0·7 to 0·8 per cent., and fermentation was completed in 12 to 15 hours. The whey is then clarified and bottled after charging with carbon dioxide. A sweetening agent (sugar or honey) may be added before or after inoculation and fermentation, and a fruit flavour prior to bottling.

462,170. **Dyes for vegetables.** I.G. FARBENINDUSTRIE AKT.-GES., Frankfurt-on-Main, Germany.
Heat-stable dyes for vegetables and fruit consist of certain substituted derivatives of 4,4'-diaminotriphenyl carbinol. A dyestuff suitable for colouring beans, for example, is derived from 2,6-dichlorobenzaldehyde and diethylaniline. A dyestuff for peas is derived from p-chlorbenzaldehyde and N-dihydroxy ethyl-meta-toluidine.

NEW COMPANIES

Ayrshire Fishing Company, Limited. (325,689.) To carry on the bus. of trawlers and fishermen, etc. Nom. Cap.: £10,000. Dirs.: W. A. Bennett; H. M. Cook, Orchards, Humberstone Avenue, Grimsby (mng. dir.); J. F. Cook, Ringwood, Weelsby Road, Grimsby.

Baker and Wood, Limited. (326,642.) To carry on the bus. of meat salesmen, etc. Nom. Cap.: £15,000 in £1 shares. Dirs.: T. R. Wood, 66, Salisbury Road, Moseley, Birmingham (permt. dir. and ch.); B. Clarke, 54, Beaconsfield Road, Cannon Hill, Birmingham.

Beales Bros., Limited. (325,690.) 225, Upper Tooting Road, Tooting, S.W. 17. To carry on the bus. of butchers, etc. Nom. Cap.: £10,000. Permt. gov. dirs.: E. A. Beales, Rushton, 4, Cressingham Grove, Sutton; R. G. Beales, 18, Benhill Wood Road, Sutton, Surrey; B. N. New, 59, Pagoda Avenue, Richmond, Surrey.

A. Brayshaw Canners, Limited. (327,119.) To carry on the bus. of manufacturing, preparing, canning, bottling and packing cereals, garden products, etc. Nom. Cap.: £2,000.

G. and T. Bridgewater, Limited. (326,366.) To carry on the bus. of confectioners, biscuit mnfrs., etc. Nom. Cap.: £100,000 in 50,000 pref. shares of £1 and 200,000 ord. shares of 4s. Dirs.: T. H. Bridgewater, Heathfield, Queen's Road, Weybridge; G. V. Bridgewater, Emberfield, Broom Road, Teddington; G. S. Bridgewater, Southern Farm, Chipstead, Surrey.

F. W. Burgess and Sons, Limited. (327,300.) To take over the bus. of bakers and confectioners, café and restaurant proprietors, etc., cd. on at Shaw Street, Bridge Street, and Rectory Chambers, Newcastle-under-Lyme, and at Hanley and Stoke, as "Burgess". Nom. Cap.: £5,000. Permt. mng. dir. and ch.: F. W. Burgess, 11, Whitmore Road, Newcastle, Staffs.

Fifeshire Fishing Company, Limited. (325,706.) To carry on the bus. of trawlers and fishermen, etc. Nom. Cap.: £10,000. Dirs.: W. A. Bennett; H. M. Cook, Orchards, Humberstone Avenue, Grimsby (mng. dir.); J. F. Cook, Ringwood, Weelsby Road, Grimsby.

Hallam and Wilson, Limited. (325,870.) To take over the bus. of bakers and confectioners and café proprietors cd. on at 152, Alfreton Road, and elsewhere in Nottingham as "Hallam and Wilson"; at 84, Lumley Road, Skegness, as "R. P. Bennett"; and at 15, Tamworth Road, Long Eaton, as "Hallam and Wilson". Nom. Cap.: £10,000. Dirs.: H. Hallam, 152, Alfreton Road, Nottingham; Mrs. M. A. Hallam, 152, Alfreton Road, Nottingham; Kate Wilson, 199, Middleton Boulevard, Nottingham.

Mars Confections, Limited. (325,877.) To take over the bus. of Mars Confections, Ltd. Nom. Cap.: £50,100. Dirs.: F. E. Mars, address not stated; Ethel M. Bunting, address not stated; W. B. Enever, Broad Street House, Old Broad Street, E.C.

Massingere Estates (Nyasaland), Limited. (327,207.) 113, High Holborn, W.C. 1. To carry on the bus. of planters, farmers, agriculturists, etc. Nom. Cap.: £2,000. Dirs.: C. W. Taylor, Chiromo, Nyasaland Protectorate; H. H. Ibbott, 159a, Silver Street, Upper Edmonton, N. 18.

McEvoy and Pinnington, Limited. (326,130.) 12 to 20, Highfield Street, Liverpool. To take over all or part of the undertaking of P. McEvoy, Sons and Pinnington, Ltd., and to carry on the bus. of importers, exporters, and preservers of live and dead stock, provisions, etc. Nom. Cap.: £30,000. Dirs.: H. B. Pinnington, Forton Lodge, Blundellsands; W. Pinnington, 5, Banks Avenue, Meols, Ches.; P. E. McEvoy, Abbeylands, Settle, Yorks.

Milk Bar Developments, Limited. (326,490.) 1 to 3, Stanley Street, Liverpool, 1. To acquire, hold, and deal in shares of Farmer Giles' Milk Bars, Ltd. Nom. Cap.: £10,000 in 7,500 pref. shares of £1 and 50,000 ord. of 1s. Dirs.: C. Blankstone, 22, Carisbrooke Road, Edgbaston, Birmingham (permt. gov. dir.); G. Blankstone, 22, Carisbrooke Road, Edgbaston, Birmingham; A. Ellison, 31, Forest Road, Meols, Ches.; H. J. Cave, 30, Willows Crescent, Birmingham.

Prices (Southern Confectioners), Limited. (324,884.) Leigh Road, Eastleigh. To take over the bus. of bakers and confectioners and cake manufacturers cd. on at Southampton, Portsmouth, Bournemouth, and Southend-on-Sea as "Price Brothers". Nom. Cap.: £25,000. Permt. dirs.: B.G. Price, Rosslyn, Northlands Road, Southampton (gov. dir.); A. Price, Diamude, Russell Place, Southampton (ch.); F. B. Price, Dudley House, Glenferness Avenue, Bournemouth; P. Price, Silverdale, Romney Road, Upper Bassett, Southampton; G. E. Hunter, Carus Lodge, Sandbourne Road, Bournemouth; F. R. Price, Diamude, Russell Place, Southampton.

James A. Stephen and Sons, Limited. (325,592.) Paragon House, Paragon Street, Hull. To take over the bus. of a herring curer cd. on by J. A. Stephen, the elder, at Hull, Great Yarmouth, Peterhead, and elsewhere. Nom. Cap.: £3,000 in £1 shares.

Towers Creameries, Limited. (324,642.) 10, Commonside East, Mitcham, Surrey. To carry on the bus. of producers, mnfrs. and importers, grocers and provision mchts., dlrs. in butter, milk, etc. Nom. Cap.: £20,000. Subs.: F. Kinnear, 3, Springall Street, S.E. 15 (clk.); R. Kapprell, Highlands, Shenfield, Essex (clk.).

Vernon and Tear, Limited. (325,429.) To take over the bus. of butchers cd. on at 41, High Street, Shirley, Southampton, as "Vernon and Tear". Nom. Cap.: £4,000 in £1 shares. Permt. dirs.: J. Wright, 28, Point Out Road, Bassett, Southampton; and J. R. Vernon and F. W. Tear, both of 20, Torquay Avenue, Southampton.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.

LATEST TRADE MARKS

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal", and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

GARUM.—573,640. **A preparation of liver, fat pork, game, veal, bacon, cereals, salt and pepper, in paste form, being a relish.** BRAND AND CO., LTD., 72 to 84, South Lambeth Road, Vauxhall, London, S.W. 8. April 21.

GIRL PAT.—570,013. **Dried fruits, nuts (for food), dates, canned fruits, and canned vegetables.** BARROW, LANE AND BALLARD, LTD., Pudding Lane, London, E.C. 3. (By consent.) April 21.

GREEN RIVER. — 575,440. **Beverages (not alcoholic, not aerated, and not medicated) and preparations for making such beverages.** L. ROSE AND CO., LTD., 89, Worship Street, London, E.C. 2. April 28.

HIGHLANDER.—573,446. **Milk and milk products (for food).** NESTLÉ'S MILK PRODUCTS, LTD., 6 and 8, Eastcheap, London, E.C. 3. May 5.

Registration No. 379,888 (2075) will be cancelled if and before the applicants' mark is registered.

HILT. — 575,907. **Edible oils and edible fats.** WESTERN MARGARINE, LTD., Alliance Factory, Western Avenue, Acton, London, W. 3. April 28.

KIDDIE.—574,950. **Canned fruits.** JOSEPH TRAVERS AND SONS, LTD., 119, Cannon Street, London, E.C. 4. March 17.

KOOPONGA.—572,869. **Substances used as food or as ingredients in food.** WARREN AND REYNOLDS, LTD., 115 to 121, Tooley Street, London, S.E. 1. April 28.

Registration No. 493,660 (2663) will be cancelled if and before the applicants' mark is registered.

LILY OF THE VALLEY. — 572,870.

LILY OF THE VALLEY

Bacon, butter, lard (for food), margarine, and cheese. WARREN AND REYNOLDS, LTD., 115 to 121, Tooley Street, London, S.E. 1. May 5.

Registration No. 355,436 (1870) will be cancelled if and before the applicants' mark is registered.

MEESONIA.—575,545. **All goods in Class 42, which includes substances used as food or as ingredients in food.** MEESONS, LTD., Newton Street, Droylsden, Manchester. (Associated.) April 14.

MILITARY.—573,700. **Pickles and sauce.** HAYWARD BROTHERS, LTD., Montford Place, Kennington, London, S.E. 11. (Associated.) May 5.

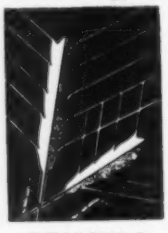
Advertised before acceptance, the applicants alleging distinctiveness.

PAT-A-FISH. — 575,740. **Dried breadcrumbs for use as a dressing for fish.** JOHN CRAMPTON AND CO., LTD., 31 to 33, Princess Street, Chester Road, Manchester, S.W. May 5.

PORTOLA. — 575,168. **Canned fruits, canned vegetables, canned fish, canned meats.** ANDERSON AND COLTMAN, LTD., 5, Philpot Lane, London, E.C. 3. March 24.

Registration No. 313,957 (1638) will be cancelled if and before the applicants' mark is registered.

PRIMULA.—572,900. **Biscuits.** O. KAVLI AKTIESELSKAP, Damsgaardsveien 59, Bergen, Norway. March 24. (Associated.)



PRIMULA

Registration of this trade mark shall give no right to the exclusive use of the devices of ears of barley.

REGENT. — 574,356. **Flour.** MARDORF PEACH AND CO., LTD., Old Trinity House, 5, Water Lane, London, E.C. 3. March 17. (By Consent.)

REGENT.—575,022. **Beverages (not alcoholic, not aerated, and not medicated).** THE LONDON ESSENCE CO., LTD., Lofresco Works, 53, Glengall Road, Peckham, London, S.E. 15. March 17.

REX. — 574,793. **Fruit juice beverages (not alcoholic, not aerated, and not medicated).** THE LONDON ESSENCE CO., LTD., Lofresco Works, 53, Glengall Road, Peckham, London, S.E. 15. April 21.

SILVER CUP.—566,872. **Butter and margarine.** BAINES AND WHITMORE, LTD., 14, Halford Street, Leicester. (Associated.) April 28.

SILVER JOY. — 575,572. **Canned fish, canned fruits, canned meats, and canned vegetables.** ICKO GOLDSTEIN, 4, Brabant Court, Philpot Lane, London, E.C. 3. April 14.

STATE COACH. — 575,426. **Substances used as food or as ingredients in food, but not including condensed milk, biscuits, shortbread, or chocolate, and not including any goods of the same description as any of these excluded goods.** SALE TILNEY CO., LTD., 3, Lloyd's Avenue, London, E.C. 3. March 31.

TRANSMONTANA. — 572,513. **Bacon, pork, fresh or preserved pork products (for food), and butter.** ALBERTO DE ANDRADE, Entrade Geral de Guaporé, Passo Fundo, District of Mauá, State of Rio Grande do Sul, Brazil. March 31.

WEE SCOTTIE. — 573,392. **Shortbread.** JOHN MARSHALL THOMSON and DAVID JOHNSTONE THOMSON, trading as Thomson Bros., 20, Queen Street, Dumfries, Scotland. April 28.

The applicants undertake to use the mark only on shortbread produced at Dumfries.

Registration of this trade mark shall give no right to the exclusive use of the words "Wee Scottie".

WHITE MAIDEN.—575,020. **Canned fish.** MITSUI BUSSAN KABUSHIKI KAISHA, 1-2, Chome, Muromachi, Nihonbashi-Ku, Tokio, Japan, and Royal Mail House, Leadenhall Street, London, E.C. 3. March 31. (Associated.) (By Consent.)

WISHBONE.—573,792. **Substances used as food or as ingredients in food, but not including tea, confectionery, bacon, hams, lard, or butter, and not including any goods of the same description as any of these excluded goods.** C. SHIPPAM, LTD., East Walls, Chichester, Sussex.

571,081.—**Potatoes for food.** J. JOHNSON

AND SON, LTD., 47 to 51, Great Nelson Street, Liverpool, 3. (Associated.) April 21.

574,831. — **Dates.** ALFRED CHANNON FINCKEN and BURLEIGH WILSON FINCKEN, trading as A. C. Fincken and Co., 197, Great Portland Street, London, W. 1. April 7.